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A compilation of the summary portions of the Research and Technology Objectives and Plans *(RTOPS)* used for management and control of research currently in progress throughout NASA has been published under the title *Research Technology Objectives and Plans Summary, Fiscal Year 1979*. It is announced as accession number N79-14929 on page 674 of this issue of *STAR*.

This *RTOP SUMMARY* also should help expedite the NASA program of technology transfer to the private sector.

RTOP SUMMARY FY1979 may be purchased from the National Technical Information Service, Springfield, Virginia, 22161, for $4.75 in paper copy or $3.00 in microfiche. (The cost for customers outside the United States is $9.50). The accession number N79-14929 should be specified when ordering this publication.

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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

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For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 672
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 674
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 675
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 675
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 676
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 680
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 680
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 681
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 681
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 681
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 682

Note: N.A. means that no abstracts were assigned to this category for this issue.

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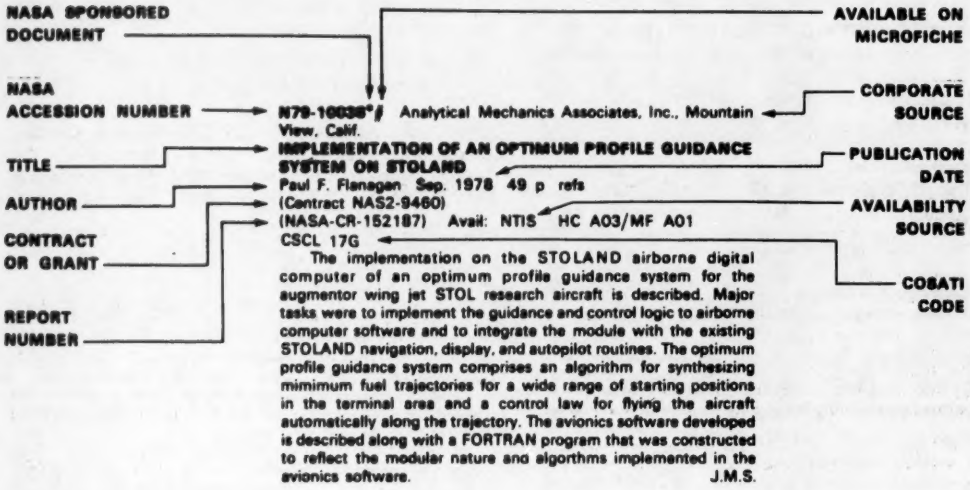
TYPICAL CITATION AND ABSTRACT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TITLE
IMPLEMENTATION OF AN OPTIMUM PROFILE GUIDANCE SYSTEM ON STOLAND
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The implementation on the STOLAND airborne digital computer of an optimum profile guidance system for the augmentor wing jet STOL research aircraft is described. Major tasks were to implement the guidance and control logic to airborne computer software and to integrate the module with the existing STOLAND navigation, display, and autopilot routines. The optimum profile guidance system comprises an algorithm for synthesizing mimimum fuel trajectories for a wide range of starting positions in the terminal area and a control law for flying the aircraft automatically along the trajectory. The avionics software developed is described along with a FORTRAN program that was constructed to reflect the modular nature and algorithms implemented in the avionics software.
J.M.S.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects— not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, ADVANCED CONCEPTS FOR COMPOSITE STRUCTURE JOINTS AND ATTACHMENT FITTINGS
N.J. Mocerino, Summa Corp., Hughes Helicopters Div, *Centinela Ave. & Teale St., Culver City, California* 90230 (DA0E3800; DAAJ02-77-C-0076)

The objective of this program is to develop the necessary methodology for designing composite joints and attachment fittings permitting disassembly for joining major structural components.

Efforts will be made to survey, design, evaluate and establish representative attachment fittings and joints (composite or metal) for attaching composite structures to new or existing structural members of the helicopter, such as attaching a composite vertical fin to a tailboom or attaching an all composite tailboom to an existing helicopter. This program will include analyzing structural design and methods for shear-diffusing concentrated loads at point of attachment to outer skins and/or areas of less stress intensity. The results shall be put in the form of a design guide.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0002, NOISE ABATEMENT FOR JET AIRCRAFT GROUND RUN-UP
G.E. Warren, U.S. Dept. of Defense, Navy, Civil Engineering Lab., *Port Hueneme, California* 93043 (DN887074)

To validate methodology and instruments for acquisition of environmental noise data in vicinity of air installations and to define technological problem areas in noise abatement program.

Perform a comprehensive evaluation of available equipment for portable noise monitoring and compare utility, cost and reliability. Utilize NAS Miramar as a test bed for an experimental continuous monitor system to make measurements for community noise criteria. Scope is to include noise of ships, aircraft, shore facilities, personnel effects, and task interference. Define technological problem areas in Navy noise abatement program and develop exploratory development program to address problem areas.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Facilities Engineering Command

1.0003, WINDSHEAR - DULLES
A.J. Bedard, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (RAA7 92 77)

PROJECT OBJECTIVE: Continue test and evaluation of Gust Front Monitor/Warning System for Dulles International Airport and study the operational implementation of the system at other airports.

CURRENT YEAR PLAN: 1. Provide consulting services to FAA as required. 2. Continue analysis of gust front events and operation of instrumentation, and transfer operation of instrumentation to Weather Service. 3. Continue operation of Dulles system. 4. Limited production of advanced sensor designs.

PROGRESS REPORT: Completed analysis of data set for 1977.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0004, ADVANCED COMPOSITE UTTAS ROTOR HUB PRELIMINARY DESIGN
E. Olster, United Technologies Corp., Sikorsky Aircraft Division, *N. Main St., Stratford, Connecticut* 06602 (DA0E3784; DAAJ02-77-C-0056)

Conduct a preliminary design and determine the merit of an advanced composite main rotor hub for the UH-60A (UTTAS) helicopter.

Contractor will first establish design criteria and specifications for a flightworthy composite main rotor hub for the UTTAS. Three design concepts which make maximum use of existing rotor system components will be developed and then a trade-off study will be performed. One concept will be selected and a preliminary design prepared. The following analyses/estimates will be performed: damage tolerance; preliminary structural vulnerability; reliability; RCS; cost-weight; producibility; and lightning protection. Upon completion of the preliminary design evaluation a program review will be held at this laboratory.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0005, VORTEX AUGMENTATION DEVELOPMENT
R.S. Reilly, United Technologies Corp., Government Products Division, *P.O. Box 2691, West Palm Beach, Florida* 33402 (DN796807; N0019-76-C-0553)

Evaluation mixed-flow augmentation improvements based on a unique vortex burning and mixing (vorbix) concept. Specific goals include increased combustion efficiency (90%) over a complete A/B fuel schedule, improve A/B stability, continuous A/B fuel flow modulation, and significant length reduction potential.

Design and fabricate a full-scale, flight-type vortex augmenter followed by instrumentation and operational check-out on a F401 test vehicle. Contingent on successful sea-level test results, the experimental vehicle will be evaluated throughout a typical flight envelope with emphasis in the upper left hand corner.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0006, FUEL CHARACTER EFFECTS ON HIGH MACH TURBINE COMBUSTION
A.L. Verdouw, General Motors Corp., *4700 W. 10th St., Indianapolis, Indiana* 46206 (DF461480; F33615-77-C-2041)

To determine the effects of fuel character changes on the high Mach combustor being developed for the next generation of Air Force gas turbine engines.

A series of full annular combustor rig tests will be performed on the high Mach combustor being developed at Detroit Diesel

Allison Division, General Motors Corporation. The tests will evaluate performance changes, starting problems, emissions, and durability problems that may be associated with using off-spec fuels. The fuels used will have lower volatility and low hydrogen content than JP4.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0007, ADVANCED ENGINE CONTROL/DIAGNOSTICS INTEGRATION AND DEMONSTRATION
J. Weber, General Motors Corp., Detroit Diesel Allison Div, *4700 W. 10th St., Indianapolis, Indiana* 46206 (DN889783; N00140-78-C-0027)

The objectives of this program are to develop, verify and demonstrate computer software (control logic) capable of closed-loop control of an advanced variable cycle engine (VCE). The logic developed for demonstration on the joint technology demonstrator (JTD) engine will provide closed-loop control of all engine variables and will provide gradual transients because of the experimental nature of this engine. The control logic will be programmed into the Bendix EH-K1 engine-mounted digital controller for the demonstration. Alternate control logic will be developed for verification via hybrid computer simulation, which will fully demonstrate the VCE features, such as airflow regulation, specific fuel consumption (SFC) optimization, thrust response optimization, etc. The logic will include control system diagnosis as well as some sensor, actuator and engine performance condition monitoring.

This program is planned as a two-phase effort of approximately 30 months' duration. Phase I consists of control logic development, input signal characterization, control diagnostics and engine condition monitoring logic development, software coding the checkout on the hybrid computer, and finally on-engine demonstration during the build-up (BU) 1 test of the HTD engine. Phase II will consist of the updating of the control and diagnostic logic, updating and recoding the software, and demonstration on the BU 2 test of the JTD engine.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0008, ANALYSIS OF VARIABLE AIRPORT USER CHARGE AT HEATHROW AIRPORT, LONDON, ENGLAND
L.N. Ericson, Booz Allen & Hamilton Inc., 04330 East West Highway 20014, *4330 East West Hwy., Bethesda, Maryland* 20014 (DOT-OS-80044)

The contractor shall perform an independent and objective analysis of the BAA peak pricing policy to determine, on the basis of existing data, whether the variable airport-use charges exceed the full unit cost to the BAA providing airport services after appropriate deductions for depreciation and a fair rate of return. The contractor shall determine the BAA's policy of assignment of revenues to cost categories and compare the revenues produced by these charges against costs designed to be covered by these revenues. The analysis shall provide a critique of the appropriateness of the BAA's cost allocation policy. The analysis performed by this study should be of such a quality as to be used, if it finds that the charges are excessive, in possible consultations over the level of the charges. Wherever possible, the contractor shall use economic principles and accounting practices recognized in the United Kingdom generally and particularly in the U.K. government's policy for the determination of charges for nationalized industries.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0009, VULNERABILITY REDUCTION OF AIRCRAFT ENGINES
W.S. Thompson, U.S. Dept. of Defense, Army, Armament Research & Development Command, Vulnerability Lethality Div., *Aberdeen Proving Ground, Maryland* 21005 (DA0P4483)

Conduct studies and tests to establish new concepts and evaluation methodology for the reduction of vulnerability in aircraft propulsion systems.

Analyze vulnerability of T700 and T800 engines; conduct projectile and fragment firings against static and dynamic engines; and participate with Air Force Aeropropulsion Laboratory in developing a simulator for turbine engine compartment fires.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Labs.

1.0010, DEVELOP NOISE CHECK TECHNOLOGY FOR MONITORING AIRCRAFT NOISE
D. Bishop, Bolt Beranek & Newman Inc., *50 Moulton St., Cambridge, Massachusetts* 02138 (DF322710; F33615-77-C-0514)

A vital part of Air Force environmental noise planning efforts is the need to perform spot-check noise measurements which provide data supporting predicted noise exposure values and the corresponding decisions made regarding land use compatibility and environmental noise impact. The objective of this contract is to develop the aircraft noise monitoring technology needed by Air Force personnel to collect field measured noise exposure data acceptable as evidence in cases involving extreme controversy or litigation.

The contractor will review the present state-of-the-art in aircraft noise monitoring technology. He will develop specific procedures and instrumentation requirements for use by Air Force personnel in collecting noise exposure data able to withstand the closest technical scrutiny. The contractor will demonstrate the adequacy of the proposed AF noise check methodology by performing an actual field application study at an AF airbase. Refinements in noise check will be made after analysis of the data from the field application study.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Labs.

1.0011, MINIMUM-WEIGHT, FAST-REACTION, INTEGRATED INERTIAL SENSOR ASSEMBLIES FOR SHIPBOARD V/STOL AIRCRAFT
R.C. Burns, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DN890045; N00019-78-C-0120)

To define and specify a minimum-weight, fast-reaction, integrated inertial sensor assembly for shipboard V/STOL aircraft. High-performance, strap-down laser gyros will be used in redundant configurations, along with air data sensors, to provide inertial and air data for navigation, weapon delivery, flight control, and pilot display functions.

Shipboard air operations, mission scenarios, and performance requirements of Navy/Marine Corps V/STOL aircraft will be studied and analyzed as an essential part of this effort. The information obtained will be used, along with related technical data from other sources, to define performance goals, conduct configuration trade-offs, and specify an integrated inertial sensor assembly configuration capable of meeting the required operational objectives.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0012, VISUAL LANDING AIDS (VLA) SIMULATION
M. Kolodner, U.S. Dept. of Defense, Navy, Naval Air Engineering Center, *Lakehurst, New Jersey* 08733 (DN796000)

To be able to simulate all platforms/planes, VLA configurations, and make recommendations on improvements of existing and new configurations.

There are several government facilities as well as private industries that have highly sophisticated simulation facilities and with slight modification can add the testing of the VLA equipment for all types of platforms and planes.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0013, DEVELOPMENT OF AIRCRAFT DEPARTURE CRITERIA
W. Bihrle, Bihrle Applied Research Inc., *400 Jericho Tpke., Jericho, New York* 11753 (DN881164; N62269-77-C-0106)

To develop selected aircraft departure criteria and associated design charts and to demonstrate correlation with existing aircraft. this contract supports work unit ZA601, 'Aircraft Technology,' Agency Accession Number DN681080.

Differing models of CNA, CN, CL (as functions of A, B, and GE) and mass distribution will be applied to 6 D.O.F. equations to determine departure susceptibility. Design charts will be constructed depicting departure-stable and unstable conditions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0014, SERVICEABILITY EVALUATION OF F-14 COMPOSITE MAIN LANDING GEAR STRUT DOOR AND OVERWING FAIRINGS

J. Mahan, Grumman Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN881339; N62269-77-C-0436)

To provide actual long-term service environmental data for composite structures and to identify any potential environment-related problems which may exist. To evaluate durability, reliability and maintenance requirements of composite structures in the Navy operational environment. This work is in support of work unit ZA601, 'Aircraft Technology', Agency Accession No. DN 681080.

Under previous contracts, composite overwing fairings and main landing gear strut doors for the F-14 aircraft have been fabricated and will be installed on Navy fleet aircraft. Under this contract, the condition and maintenance requirements of these components will be closely monitored by contractor field service representatives. Instructions will be prepared for squadron and field service personnel containing nondestructive inspection schedules and methods, damage criteria and repair and maintenance procedures specifically for these components. All significant occurrences pertinent to the composite components during the service usage will be recorded. The composite fairings and doors will be left in service for a period of up to five years. Periodically a set of components will be removed for NavAirDevCen inspection and laboratory evaluation.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0015, NON-LINEAR ANALYSIS AND DESIGN OF SUPERSONIC AIRCRAFT

F.J. Marconi, Grumman Corp., Grumman Aerospace, *S. Oyster Bay Rd., Bethpage, New York* 11714 (DF140820; F33615-77-C-3126)

A more accurate method for analyzing advanced supersonic aircraft configurations over a wide range of flight parameters is required beyond the present linear methods. The non-linear analysis/design methods will enable handling realistic future military type aircraft geometries. There will be significant acquisition cost savings due to the accuracy and the reliability of the method. The objective of the effort is to generate a user-oriented computer code that gives the aerodynamic parameters of interest and detailed flow field characteristics around the aircraft. Military aircraft not only will have complex geometries but also operate over a wide range of flight parameters. These problems are non-linear in nature and therefore non-linear methods are required to generate reliable data useful for designers.

Cross-sectional geometries of aircraft will be transformed conformally into simpler shapes such as circles and rectangles, and the appropriate non-linear Eulerian equations will be solved by finite difference techniques. Reliability of the schemes will be established.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0016, LOW-CYCLE THERMAL-MECHANICAL FATIGUE OF TURBINE VANE SUPERALLOYS

H.G. Popp, General Electric Co., Aircraft Engine Group, *1 Jimson Rd., Cincinnati, Ohio* 45215 (DN590219; N00019-77-C-0111)

To investigate metallurgical factors which affect the low-cycle, thermal-mechanical fatigue of superalloys used in aircraft gas turbine vanes.

Alloys to be investigated include the cobalt alloy X-40, as a reference, and the nickel base alloys ODS MA 754, ODS MA 757, ODS YD NiCrAl, and D.S. Ni 76 x B. Studies will be made of the effects of processing, microstructural orientation, ductility, notches, coatings, and carbon content in X-40. Comparative thermal-fatigue data will be obtained in simulated engine thermal shock test rigs, fluidized-bed tests, and in laboratory tests where strain and temperature are independently varied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0017, DYNAMIC BEHAVIOR OF SPLITTERS AND DUCTS

W. Steenken, General Electric Co., *1 Jimson Rd., Cincinnati, Ohio* 45215 (DF459120; F33615-77-C-2081)

To define the dynamic interactions which occur at interfaces between engine ducts and other engine components. The effect of these dynamic interactions on engine stability will also be defined.

The program will combine test effort and analytical effort. The test effort will provide dynamic data at the interface to compare with dynamic simulations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0018, NAVY VEHICLE DESIGN AND CONSTRUCTION - LIFTING SURFACE THEORY FOR THRUST AUGMENTING EJECTORS

P.M. Bevilaqua, Rockwell International Corp., Aircraft Division, *4300 E. 5th Ave., Columbus, Ohio* 43216 (DN775363; N00014-77-C-0271)

The objective of this investigation is to develop a computational technique for thrust augmenting ejector analysis that will include the effects of conditions external to the ejector as well as flow within the ejector shroud. For thrust augmenting ejectors in V/STOL aircraft applications, the influence of the aircraft wing/body, the proximity of the ground in landing and takeoff and the requirement for shorter, more compact diffuser sections all have an influence on augmentor performance. Classical ejector analysis considers only conditions internal to the ejector shroud and therefore cannot satisfactorily predict overall ejector performance when installed in a V/STOL configuration.

The approach taken in this effort is to separate the ejector flow field into two regions: the flow through the ejector and the flow external to the ejector. The internal flow will be calculated using classical momentum theory while lifting surface theory will be used for the external flow and the solutions will be properly matched to give a solution valid for the entire flow field.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0019, V/STOL FLYING QUALITIES CRITERIA DEVELOPMENT

K. Rowe, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF141900)

This work supports the flying qualities specification MIL-F-8785B, and the flying qualities of piloted V/STOL aircraft specification, MIL-F-83300. In the past seven years since the release of the current specification, MIL-F-83300, there has been considerable work done in the area of piloted V/STOL aircraft. This new data should be used to update and validate this specification. In addition, the overall schedule for the change in format for all specifications to MIL-STD's indicates that MIL-F-83300 is to be combined with MIL-F-8785B by 1981. The objective of this work is to- 1) review and revise the flying qualities criteria for piloted V/STOL aircraft as presented in MIL-F-83300 and 2) combine MIL-F-83300 and MIL-F-8785B into a single flying qualities standard or justify the need for an additional standard for V/STOL aircraft. Accomplishing this objective will help assure the flying qualities, and therefore the safety, of piloted V/STOL aircraft.

The approach to achieve this objective includes reviewing available V/STOL flying qualities data and comparing it with the requirements of MIL-F-83300. Flying qualities data from contracted efforts, the AMST development, etc., will be used to validate or revise these requirements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0020, HIGH ANGLE OF ATTACK AERODYNAMIC PREDICTION METHODS
H.W. Woolard, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF141590)

The overall concern of this program is the improvement in the stability and controllability characteristics of fighter aircraft operating in the high angle-of-attack flight regime, with the goal of reducing fighter aircraft losses due to inadvertant departure into uncontrolled flight. The specific technical objective is the development of analytical prediction methods for the aerodynamics of aircraft and aircraft components at high angle of attack.

The approach will employ theoretical analyses complemented by the use of existing experimental data. The theoretical methods will be employed in a manner designed to understand the aerodynamic phenomena involved as well as to supply practical prediction methods. In developing the methods, emphasis is to be placed upon minimizing the amount of empiricism employed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0021, APPLICATION OF FLIGHT LOADS DATA TO THE DEVELOPMENT OF USAGE AND ENVIRONMENTAL SPECTRA
L.E. Clay, University of Dayton, Graduate School, *300 College Park Ave., Dayton, Ohio* 45469 (DF139950; F33615-77-C-3038)

This work unit is being established in order to make available flight loads data which is to be used for design, analysis, and testing of aircraft structures. Recent advances in structural loads data collection methods and equipment have generated large amounts of comprehensive data. There exists at this time no widely accepted method for presenting this data in useful form to aircraft structural designers and analysts. The objective of this effort is to produce a handbook containing significant amounts of data from various types of aircraft, presented so as to be useful to performing analysis and testing as well as to complement structural specifications. Availability of the actual data will lead to more realistic structural test spectra and more representative results.

The compilation and publishing of the handbook will be done under contract and in two volumes. Volume One will contain data. Volume Two will contain theory, explanations, recommended procedures and uses, and other supportive information.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0022, SPECTRUM FATIGUE TESTING OF GRAPHITE/EPOXY BOLTED JOINTS AIRCRAFT
J. Clark, Boeing Co., *P.O. Box 16858, Philadelphia, Pennsylvania* 19142 (DN881381; N62269-77-C-0340)

To make an in depth study of the CH 46 aircraft structure in order to eliminate stress, corrosion, and cracking (SCC) in service. All potential SCC problem areas will be delineated and changes recommended for elimination of SCC, AFT technology, Agency Accession No. DN 681080.

A study will be made of all 7075, 7079, and 2024 aluminum parts, all steel parts heat treated to 200 KSI and above, and all magnesium parts. A rating system will be developed considering the main parameters affecting the occurrence of SCC. Recommendations will be made for eliminating stress corrosion cracking in susceptible parts.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0023, DEVELOPMENT OF HUMAN FACTORS ENGINEERING DATA AND METHODS FOR ADVANCED AIRBORNE SYSTEMS EXPLORATORY (BLOCK PROGRAM)
R.J. Wherry, Unknown Inst. or Indiv. Grant, Chalfont 18914, *Pennsylvania* (DN881368; N62269-77-R-0164)

To develop and implement a defensible rationale and objective, standardized, interactive terminal process for determination of which displays and controls to group together on the same panels or within the same subgroup on different panels in order to achieve greatly improved panel design, reduced operator training time, and reduced human engineering skill requirements. The proposed process will replace the method which is currently employed by human engineers.

A. Describe major deficiencies in current method. B. Develop rationale/approach for the new process. C. Develop information flow diagrams for the new process. D. Develop detailed specifications for the new process. E. Develop user instructions for the new process. F. demonstrate feasibility of the new process. G. Deliver final report documenting the work accomplished.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0024, HT PP 78-12 - INVESTIGATION OF DRIVE SHAFT SYSTEM DESIGN REQUIREMENTS
Unknown, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3824)

To investigate drive shaft system problems encountered during recent helicopter development programs and on production aircraft, to define critical design parameters and limitations of current design tools.

Conduct discussions with major airframe manufacturers and drive shaft coupling manufacturers, to review past DOD reports and professional association papers pertaining to drive shaft system problems, and review MIL. specs. pertaining to helicopter drive shafting. Summarize results in a report.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0025, RAPID EVALUATION OF PROPULSION SYSTEM INSTALLATION EFFECTS
W.H. Ball, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF140340; F33615-77-C-3085)

It is necessary in the evaluation of any advanced technology application to military aircraft or the assessment of the value of advanced aircraft to be able to predict aircraft performance with accuracy. In order for such a prediction method to be effective, it must be rapid in order to keep up with the large volume of data required for an effective study. The objective of this effort is to improve the efficiency and accuracy of the current propulsion installation procedure. With this method, more reliable estimates may be made of the performance characteristics of conceptual flight vehicles.

The approach to be followed is to develop modifications to the PIPS calculation program to enable it to interactively use a stored library of inlet and nozzle/aftbody maps, and to determine the optimum scheduling between bypass and spillage drag. In addition, a procedure will be developed to determine the effects on inlet and aftbody performance of configuration changes that are not represented in the basic stored inlet maps.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, EDUCATION SATELLITE TECHNOLOGICAL OPTIONS STUDY
J. Brown, Operations Research Inc., *1400 Spring St., Silver Spring, Maryland* 20910 (EP760900; 0400760132)

An evaluation of the technical delivery aspects of education satellites together with ground terminals and available communication frequencies.

SUPPORTED BY U.S. Dept. of Health Education & Welfare, National Inst. of Education, Finance & Productivity Group

2.0002, ANALYSIS OF SATELLITE NAVIGATION SYSTEMS

B.E. Schutz, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engin & Engin Mech, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: Satellite navigation is now in extensive use for surveying and point positioning applications. These systems use the U.S. Navy Transit Satellite; however, the next generation system Global Positioning Satellite entered initial check-out and validation in 1977. To evaluate the hardware and software requirements for various applications as well as to introduce state-of-the-art astronautical systems into the classroom, initial hardware acquisition of satellite receiver systems has been made. Integration of this hardware with a computer system will provide real-time satellite tracking capability for laboratory applications and systems analysis.

SUPPORTED BY University of Texas

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, HIGH-DENSITY MISSILE FUELS RESEARCH

G.W. Burdette, U.S. Dept. of Defense, Navy, Naval Weapons Center, *China Lake, California* 93555 (DN682024)

The objective of this program is to utilize new hydrocarbon fuels synthesized by Sun Ventures, Inc. (under contract F33615-73-C-2022) in studies related to formulating improved air-breathing missile fuels with higher volumetric net heats of combustion (for increased range), lower viscosities, better storage and compatibility characteristics and lower cost.

The program approach will be to blend certain Sun fuels with existing well known air-breather fuels such as RJ-4 or RJ-5. These fuel blends will be formulated primarily with specific missiles or missions in mind (e.g., ALRAAM or GORJE). Characterization of the fuel blends will include viscosity/temperature curves, flash point, heat of combustion, long term storage and a very cursory materials compatibility study (e.g., immersion of bladder samples in fuels).

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0002, MATERIALS SUPPORT TECHNOLOGY - DAMAGE MECHANISMS AND MODELING OF CARBON-CARBON COMPOSITES

G. Sines, University of California, Los Angeles Campus, School of Engineering & Applied Science, Dept. of Engineering, *405 Hilgard Ave., Los Angeles, California* 90024 (DN775654; N00014-77-C-0505)

Carbon-carbon materials are used in propulsion and reentry components of advanced strategic systems. Failure mechanics and mechanical behavior are significantly affected by initial flaw and defect distributions which are strongly controlled by the processing the material has experienced. This research program will identify the macro and microstructural damage mechanisms and develop a physical model of the carbon-carbon as it is processed.

Through experimental observations and measurements determine the microstructural characteristics and thermal and mechanical properties of the filament and matrix phases as well as of the multidirectional composite. Actual properties will be measured as a function of processing. Extensive microstructural characterization will be conducted to isolate and determine damage mechanisms operative during processing. Crack propagation studies will be conducted in the scanning electron microscope to determine modes and sequences of constituent failures. Finally a physically based in-process model will be developed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0003, HIGH-PERFORMANCE COMPOSITES AND ADHESIVES FOR V/STOL AIRCRAFT

L.B. Lockhart, U.S. Dept. of Defense, Navy, Naval Research Lab., *Washington, District of Columbia* 20375 (DN680029)

The program objective is to develop high-toughness, high-temperature stable resins for use in graphite-fiber composites and as adhesives in V/STOL aircraft. to characterize these materials for quality control and reliability, and to utilize the materials' property data for optimized design of a prototype V/STOL structural element.

Developmental and commercial resins that promise to meet the requirements for V/STOL application will be characterized by spectroscopic and thermomechanical analysis. The mechanical performance and fracture behavior of these resins and of the adhesives and composites fabricated from them will be determined. The data will be used for (a) the design optimization of a V/STOL composite and adhesive-bonded structural element, (b) guidance for further improvements in resins, adhesives and composites, and (c) development of quality control parameters.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0004, NAVY VEH & MAT SUPP TECH STUDIES TO IDENTIFY AND IMPROVE RESISTANCE TO LOW AMPLITUDE HIGH MEAN STRESS FATIGUE OF TI ALLOY

D.A. Meyn, U.S. Dept. of Defense, Navy, Naval Research Lab., *Washington, District of Columbia* 20375 (DN880065)

To determine factors causing or abetting failure of titanium alloy aircraft components by LAHMS fatigue, identify principles for improving resistance to failure including surface treatment, composition, and heat treatment.

Conduct fatigue tests under simulated service conditions on non-precracked specimens, evaluating effects of external factors such as load history, surface coatings, environment, shot peening, and fretting. test a variety of alloys and heat treatments. Examine crack initiation and propagation mechanisms using metallography, fractography, and surface chemical analysis. Correlate results to show trends toward best performance, and produce systematic identification criteria for failure analysis.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0005, THEORY FOR STRUCTURES OF MOLECULAR LIQUIDS AND SOLUTIONS

D. Chandler, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Chemistry, *Urbana, Illinois* 61801 (CHE76-04771 A01)

Several investigations are planned which are based on theories which have been recently developed to describe the equilibrium structures of relatively complex molecular liquids. For nonaqueous fluids it is planned to use the interaction site cluster series to develop a perturbation theory which describes the effects on the intermolecular correlations of slowly varying forces in molecular fluids. This work will supplement the RISM theory which provides a method for understanding the effects of short-ranged, harshly repulsive forces. Another project based on the interaction site cluster series is the development of a theory for the pair correlation functions for mixtures of molecular liquids. The derivation of a theory for molecules with internal degrees of freedom is also planned. In particular, work is planned to determine how the intramolecular structures of non-rigid molecules depend on liquid environments. Projects for aqueous systems are also planned. Here, the work will be based on a recently developed theory for liquid water. Finally, investigations concerning non-uniform systems are planned that may lead to more fundamental understanding of the mechanism for freezing in simple systems and the mechanism for isotropic-anisotropic fluid phase transitions in liquid crystal systems. This work is a continuation of that currently supported by Foundation grant MPS-7308591.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0006, MODELING AND MODIFICATION OF THE ELECTROMAGNETIC PROPERTIES OF ADVANCED COMPOSITE MATERIALS

W. Gajda, University of Notre Dame, School of Engineering, Dept. of Electrical Engin, *Notre Dame, Indiana* 46556 (DF050250; AF-AFOSR-3453-77)

AF function - recent increased use of composite materials in AF systems has required knowledge of the electrical properties of such materials. The vulnerability of the aircraft with composite components to nuclear EMP is of importance. The vulnerability is determined, in fact, by the conductivity of the composite materials. Opportunity -this research will provide basic information useful in assessing the survivability of AF systems with composite components. Objective - the objective of this study is to understand the nature of selected advance composite materials and to subsequently develop materials with desired properties. Contribution - this research will contribute to the basic knowledge of the properties of composite materials.

This investigation will approach the goal of modification of the electrical properties of advanced composite materials by: (1) developing doping techniques to increase the conductivity of fibers used in composite materials, and (2) formulating models based upon statistical theory of random media to allow prediction of conductivity and permittivity of fiber reinforced material.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0007, NITROGEN BEHAVIOR IN MULTICOMPONENT ALLOY STEELS

R.D. Pehlke, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Metallurgical & Materials Engr, *Ann Arbor, Michigan* 48104 (DMR75-08522 A02)

This is a continuation of an experimental-theoretical (computer simulation) study of the behavior of nitrogen in multicomponent alloy steels. The solubility of nitrogen in solid and liquid Fe-Cr-Ni base alloys with additions of Mn and other nitride formers (e.g., Nb, Ti, Al) is under study. In addition, the role of alloying elements in changing nitrogen solubility in these alloys, the nature of solute interactions and quantitative evaluation of first and second order nitrogen interaction parameters, and conditions surrounding the formation of nitride compounds will be determined. Simultaneously, a computer simulation of the plasma arc remelting process is underway, to develop the information necessary for possible process improvement and optimization. This is a renewal of NSF grant DMR75-08522 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

3.0008, SUPPORT OF FIBER OPTICS

D. Ruppel, Grumman Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN896004)

Develop support concepts for fiber optics applications to avionic system.

The basic approach is to analyze the characteristics of fiber optics systems. Components and projected systems are to be evaluated for failure modes, indications of failure and degradation characteristics. failure threshold criteria with respect to systems and components will be established. Data from development programs will be acquired and studied to correlate information relative to support requirements. The characteristics of optical fibers with respect to optical fault detection and checkout will be identified. General categories of photometric test equipment will be listed, and the general impact on support described.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0009, STUDIES OF RAPID ION TRANSPORT IN SOLIDS

J.C. Wang, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF459110)

To increase fundamental understanding of solid electrolyte systems through use of theoretical calculation and recent experimental techniques applicable to studies in solid-state physical chemistry.

Study various possible local correlated motions of ions to find the correct mechanisms for conduction. Compare the calculated activation energies, jumping frequencies, and conductivities with experimental results. Perform experimental studies with possible high voltage couples using Pb and Bi.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

3.0010, RESEARCH ON METHODS TO IMPROVE THE PROPORTIONAL LIMIT OF BE/TI COMPOSITES

G.J. London, U.S. Dept. of Defense, Navy, Naval Air Development Center, Air Vehicle Technology Dept., *Warminster, Pennsylvania* 18974 (DN781164)

To improve the proportional limit of Be/Ti powder-powder extrusions to a target minimum of 40,000 PSI with minimum degradation to other mechanical properties.

Experimental Be/Ti powder-powder extrusions will be prepared utilizing either commercially pure or moderately alloyed Ti as the matrix with varied extrusion rates and temperatures. The proportional limit and other mechanical properties will be determined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0011, MATERIAL SUPPORT TECHNOLOGY - FRACTURE DYNAMICS IN POLYMERIC BINDERS

K.L. Devries, Utah Higher Education System, University of Utah, School of Engineering, Dept. of Mech Engin, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (DN780062; N00153-77-C-0068)

The short-lived free radicals generated during the dynamic fracture of polymeric binders will be studied in order to determine their role in the deflagration-to-detonation transition (DDT) in high-energy propellents.

This contract provides for 1) the construction of a servo-controlled stress-strain tester and its installation in the NRL high-speed electron spin resonance spectrometer, and 2) measurements of the free radical sequence in dynamically stressed research grade nylon 6 as a function of temperature.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

3.0012, A FUNDAMENTAL STUDY ON THE DIRECTIONAL SOLIDIFICATION OF MONOTECTIC ALLOYS

A. Hellawell, University of Wisconsin, Milwaukee Campus, Graduate School, *Bolton Hall, Room 160, Milwaukee, Wisconsin* 53201 (DMR77-11293)

This is a basic investigation on the directional solidification of monotectic alloy systems. In contrast to the lamellar structure resulting from the directional solidification of an eutectic alloy, the anticipated monotectic structure is expected to consist of aligned fibrous dispersions. This opens up the possibility to remove the lower melting point fibrous constituent when it is molten, leaving a structure permeated by evenly spaced parallel holes. This study will include the effect of temperature gradient and rate of solidification on the formation and morphology of aligned fibrous structures. Initially, the monotectic alloys In-S, Sn-S, Cu-Pb and Al-In will be studied. The experiments will be carried out using the Bridgman zone melting or Czochralski technique, and the resulting structure will be examined using x-ray and microscopic techniques.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, FLOW INTERFERENCE PHENOMENA AFFECTING DIRECT FIRE MISSILES

B.Z. Jenkins, U.S. Dept. of Defense, Army, Missile Research & Development Command, Aeroballistics Directorate, *Redstone Arsenal, Huntsville, Alabama* 35809 (DA0G1004)

The objective of this investigation is to better define the gas dynamic structure of a rocket exhaust plume in the presence of an external flow stream from subsonic through the supersonic flow regime and its flow interference on rocket performance.

A combined analytical/experimental program has been initiated which will investigate the gas dynamic structure of a rocket exhaust plume. The analytical program will utilize the JANNAF standardized plume model (PMS) which is under development as the basic analytical tool. This tool will be supplemented by additional in-house analyses directed at secondary smoke and particle entrainment. PMS will not model the base region but will be compatible with a program being developed at MIRADCOM. Solid or transverse flow plume simulators for wind tunnel use will be employed in the evaluation of the experimental program. Rocket sled testing under actual flight conditions will be employed in the experimental program.

SUPPORTED BY U.S. Dept. of Defense, Missile Research & Development Command, Aeroballistics Directorate

4.0002, THREE-DIMENSIONAL WALL JETS AND EFFECTS ON CORNER FLOWS

N. Malmuth, Rockwell International Corp., *2421 W. Hillcrest Ave., Thousand Oaks, California* 91320 (DN881122; N62269-76-C-0382)

To better understand the losses incurred and predict the resulting flow effects within thrust augmenting ejectors due to 3-dimensional effects such as span wise cross flows and end wall phenomena. This contract supports work unit NN701, Agency Accession No. DN481077.

The approach to this program will be to develop the mathematical formulation of the governing equations and boundary conditions to examine a wall jet in a coflowing field with finite cross flows and cross flow gradients (near and away from end walls). The relationships that apply some distance from the end walls will be solved numerically and parametric studies conducted to examine the effects of these finite cross flows on the evolution of velocity profiles, shear stress, pressure distributions, sideslip angles and separation. Initial formulations of the problem and finite difference solution algorithms will involve small cross flow assumptions for both the wall jet and coflowing field.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0003, OCEAN WAVE ANALYSIS BY SYNTHETIC APERTURE RADAR

A.M. Peterson, Stanford University, School of Engineering, Dept. of Electrical Engin, *Stanford, California* 94305 (DN875102; N00014-78-C-0046)

Synthetic aperture radars (SAR) will be flown on satellites (SEASAT), giving wide-area, detailed surface imagery. The interaction between microwave SAR and the moving sea surface wave field is not well understood. This program will develop methods for interpreting SAR data returns in terms of actual surface wave field, by modeling actual SAR and surface wave observations.

Aircraft SAR imagery was gathered during simultaneous ocean surface measurements off the west coast of the U.S. in 1977. These data will be analyzed and used to test a mathematical ocean wave - microwave back-scattering model. The results will be used to develop a comprehensive wave-wave interaction theory which, in turn, may enable an understanding of sea wave physical processes.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0004, ADAPTIVE ANTENNA ARRAYS FOR AIRCRAFT COMMUNICATIONS

B. Widrow, Stanford University, Stanford Electronics Labs., *Stanford, California* 94305 (DN790026; N00019-77-C-0194)

Novel adaptive techniques for processing antenna array signals will be investigated. The overall objective is to develop and determine the usefulness of several schemes for separating incoming signals by power level, spectral characteristics, angle of incidence, etc., to demodulate and identify such signals and to do this with a sparse and irregular receiving array.

Emphasis will be directed toward the investigation of a 'leaky' least mean square (LMS) algorithm. The leaky LMS algorithm appears to offer unique advantages for achieving antenna adaption under conditions where the antenna elements change their spacing due to antenna movement such as occurs for elements mounted on aircraft wings. The leaky LMS algorithm will be studied to determine stability, rate of learning, misadjustment, and demodulation distortion in the presence of broadband noise and narrowband signal inputs.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0005, WAVEGUIDE BEAM EXPANSION FOR FIBER OPTIC SOURCES AND OPTICAL INFORMATION PROCESSING

E. Garmine, University of Southern California, School of Engineering, Dept. of Electrical Engin, *3551 University Ave., Los Angeles, California* 90007 (DF903760; F19628-77-C-0221)

AF function - command and control. Deficiency/Opportunity -communications links lack security and are inefficient. Objective - to develop integrated optic laser source optimally suited for coupling to optical fiber. How research contributes - provides improved source for optical communication links.

Integrated optics will be used to render the output of a CW GaAs double-heterostructure, stripe-geometry laser compatible with coupling to optical fibers. A distributed Bragg reflector will be used to achieve spectrally narrow output. A 100 micron-square beam will be produced by waveguide beam-expansion techniques for butt-coupling to a multimode optical fiber. First, the beam will be expanded in the plane of the waveguide by using a 90-degree grating beam expander. A grating output coupler will be used to produce a laser output normal to the waveguide surface having the desired near-field spot size and pattern. The effects of blazing the gratings on output coupling will be studied. applications of waveguide beam expansion to optical signal processing will also be investigated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0006, AEROELASTIC APPLICATIONS OF TRANSONIC UNSTEADY AERODYNAMICS

T.Y. Yang, Purdue University, Purdue Research Foundation, *Life Sciences Bldg., West Lafayette, Indiana* 47907 (DF141240; AFAFOSR-3523-78)

This work unit supports the technical base functions of the structural mechanics division of the Air Force Flight Dynamics Laboratory. It addresses the problem areas of transonic unsteady aerodynamics, flutter, aeroelastic optimization and integration of aeroelastic disciplines. The goal is to create a numerical, analytical and experimental array of techniques to integrate the aeroelastic design, analysis and testing of aircraft structures to reduce the cost of design, acquisition and operation of new aircraft. This work unit will obtain substantial improvements in our ability to design, analyze and optimize aircraft structures for unsteady aerodynamic forces, vibrations, flutter, loads and aeroelastic control system interactions.

Initial developments will include the application of transonic unsteady aerodynamic computer programs to flutter problems. Finite element structural programs will also be modified to automate the input of data and the presentation of results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

4.0007, SHIPBOARD LAUNCHERS
E.A. Rawls, Chrysler Corp., *Old Gentilly St., New Orleans, Louisiana* 70129 (DN782095; N00123-76-C-0741)

Develop an engineering handbook identifying blast effects from stationary shipboard launchers.

Missile systems considered for stationary shipboard launchers include variants of standard, Seasparrow, Harpoon, ASROC, SAM-D and Seaphoenix. Also included are the advanced surface-to-air ramjet missiles (ASAR), vertical ejection launched aero reaction control (VELARC) type missiles, supersonic combustion ramjet missile (SCRAM), and any conceptual modular missile systems. A thorough analysis of blast effects for each missile system will be conducted. Blast effects includes thermal, pressure, errosive, acoustic, and corrosive damage caused by main rocket motor, missile booster, ejector, or various combinations. These effects are to be considered in respect to flyaway and restrained firings for both simple blast deflectors and plenum chambers. Possible damage to both the launcher and ship structure/systems will be assessed. The analysis will be verified with blast tests. Conceptual hardware to provide solution to blast-effect problems will be designed and demonstrated. The final report is a handbook describing the effects, the problems caused, demonstrated solutions, and guidelines for further engineering efforts.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Weapons Center

4.0008, APPLICATION OF THE DELAMINATION THEORY OF WEAR
N.D. Suh, Massachusetts Inst. of Technology, School of Engineering, Dept. of Mech Engin, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DN475061; N00014-76-C-0068)

The objective of the research is to examine wear problems associated with spline gears, aircraft door hinges, and HSS tools and improve the life by application of the delamination theory of wear.

The investigator is conducting experimental investigations of the delamination theory of wear that will include a detailed analysis of surface and surface coatings, before, during, and after the experiments. This analysis will be a cooperative among Naval Air Development Center, National Bureau of Standards, and Foxboro/Trans-Sonic.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0009, SIMULATOR HORIZONTAL SITUATION DISPLAY
G.T. Burton, Radio Corp. of America, Advanced Tech Labs, *P.O. Box 588, Burlington, Massachusetts* 01803 (DN781386; N62269-76-C-0390)

To develop a lab model holographic horizontal situation display combined with a CRT which can be used to a simulator to evaluate this technology in a realistic surrounding. This contract supports work unit ZA601 Agency Accession No. DN681080.

Portions of the breadboard equipment developed under previous contracts are being packaged, along with a CRT and its associated electronics, into a lab model.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0010, ANALYSIS AND DESIGN OF HIGHLY DECOUPLED MULTIPLE ANTENNAS
D.V. Campbell, U.S. Dept. of Defense, Army, Communications Research & Development Command, Communications Systems Center, *Fort Monmouth, Red Bank, New Jersey* 07703 (DA0F2852)

Multiple antennas, collocated as in a command post or air traffic control central, commonly give rise to cross-talk interference in the radios because of strong mutual coupling between the antennas and their feedlines. Present systems often require costly tunable bandpass filters to augment the antenna decoupling. The objective of this study is to rigorously analyze the underlying principles and to provide criteria for the design of multiple antennas with very high decoupling factors over a broad frequency band. Ultimately, enhanced system performance and reduced costs may be realized.

Investigate theoretically multiple antennas decoupled by an isolator section. Experimentally verify theoretical analysis. Evaluate theoretical model numerically using available MBA computer program.

SUPPORTED BY U.S. Dept. of Defense, Communications Research & Development Command, Communications Systems Center

4.0011, VARIABILITY AND REAL-TIME MEASUREMENTS OF METEOROLOGICAL PARAMETERS
B.W. Kennedy, U.S. Dept. of Defense, Army, Electronics Research & Development Command, Atmospheric Sciences Lab., *White Sands M.R., Las Cruces, New Mexico* 88002 (DA0F1768)

Determine variability of tropical and mid-latitude atmosphere above 30 km; extend usable measurement altitude of ROBIN sphere to 100 km; test an inflatable radar calibration sphere; test range rate program for application to Kwajalein Missile Range and White Sands Missile Range sphere missions.

Actively participate in diurnal variability programs at KMR and WSMR and elsewhere; launch light ROBIN sphere at WSMR and KMR; launch 12-inch diameter spheres at WSMR and KMR; run range rate program on ROBIN spheres at WSMR and evaluate results; act as consultant to Air Force on atmospheric density measurements in support of reentry programs.

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Atmospheric Sciences Lab.

4.0012, GENERATION AND FOCUSSING OF PULSED INTENSE ION BEAMS
R.N. Sudan, Cornell University, Ithaca Campus, Lab. of Plasma Studies, *159 Sapsucker Woods Rd., Ithaca, New York* 14850 (ES-77-S-02-4209)

The proposed work involves the focussing of intense ion beams in a spherical magnetically insulated diode to obtain a point focus. The ability to focus such beams by quadrupole magnetic lenses will also be examined. Improvements in the divergence of the emitted beam from the diode will be sought. Propagation and stability of the beams will be studied in low pressure gas.

RESULTS: Intense ion beams have been focussed in cylindrical, magnetically insulated diodes to a line focus at the current density of approximately 0.5 kA and a total current close to 100 kA. Intense ion beams to the order of 10 kA at a few hundred kV have been magnetically focussed by a dipole lens. It has been found that the propagation of the ion beams can be explained in terms of charged and current neutralized beams where the individual particles follow ballistic trajectories.

SUPPORTED BY U.S. Dept. of Energy, Div. of Laser Fusion

4.0013, TRANSONIC WING-BODY CALCULATIONS
D.A. Caughey, Cornell University, Ithaca Campus, School of Aerospace & Mechanical Engineering, *Ithaca, New York* 14850 (DN775078; N00014-77-C-0033)

The development of accurate methods for the prediction of the transonic flow fields about complex aircraft and missile configurations is essential for their design and optimization. The proposed research will develop finite-difference techniques for solving the complete potential equation for the transonic flow about three-dimensional configurations, such as wing-fuselage combinations.

The development of accurate predictive techniques for increasingly complex configurations is an evolutionary one. The planned research will extend the previous wing work of Jameson and Caughey to include the added complexity of a fuselage. Emphasis will be devoted to methods for transforming the geometries to computational domains in which the boundary conditions can be accurately and efficiently incorporated. Concomitant problems associated with the transformational procedures

(the flow is not approximately aligned with one of the coordinate directions at all points in the field) will be studied. The investigation will be conducted within the framework of the complete potential equation differenced in a non-conservative form.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0014, NEW SEMICONDUCTOR MATERIALS FOR MICROWAVE DEVICES 14354-EL

J. Frey, Cornell University, Ithaca Campus, School of Engineering, Dept. of Electrical Engin, *242 Carpenter Hall, Ithaca, New York* 14850 (DA0F9118; DAAG29-78-G-0009)

To identify ternary and quaternary III-V compound semiconductors which may be more suitable than GaAs for high-performance microwave devices, such as field-effect transistor (FET's) and transferred-electron devices (TED's). Relevance - microwave devices fabricated from III-V ternary and quaternary materials offer the possibility of extending the frequency-of-operation, increasing the available power and gain, and decreasing the noise over existing GaAs devices. Such devices would impact Army communications/navigation systems in tactical, satellite, and missile guidance applications.

The Monte Carlo method will be used to study the steady-state and transient high-field transport properties of III-V ternary and quaternary semiconductors. Material parameters will be obtained from an interpolation procedure which uses known material parameters for the binary compounds of which the ternary and quaternary materials are composed. This technique will generate fundamental transport parameters which will then be used in device models to predict figures-of-merit for FET's and TED's. The fundamental gain, power, frequency response, and noise-determining mechanisms will be studied.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

4.0015, DEVELOPMENT OF THERMAL SHIELD

C.N. Klahr, Fundamental Methods Associates Inc., *678 Cedar Lawn Ave., Lawrence, New York* 11559 (DN781233; N62269-76-C-0231)

To develop a thermal shield for occluding heat and light from military aircraft cockpit. This contract is in support of work unit DS903, Agency Accession No. DN833230.

A feasibility study has indicated that a liquid-vehicle dust wall will provide the desired end. A contract will be let to provide a small-scale section demonstrating this feasibility.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0016, MULTIPLEX INTERIOR COMMUNICATIONS

G. Cotter, Grumman Corp., Grumman Aerospace Corporation, *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN681291; N62269-75-C-0392)

To demonstrate the utility of the GPMS and develop models in accordance with the new DOD multiplexing standard. This contract supports work unit ZC201, Agency Accession No. DN681082

Based on the results of the GPMS-X program, the governing NavAirDevCen specification will be updated to reflect ADM/EDM model equipment for development. With these models the total utility of the GPMS will be demonstrated relative to servicing a total aircraft internal signal capacity.

SUPPORTED BY U.S. Dept. of Defense, Navy

4.0017, TORNADO-TYPE WIND TURBINE

J. Yen, Grumman Corp., Aerospace, *S. Oyster Bay Rd., Bethpage, New York* 11714 (E(49-18)-2555)

The research effort to determine the feasibility of scaling up the device to produce usable amounts of power involves (1) performing wind tunnel tests of three (3) progressively larger models, (2) testing of a large model in the free wind, (3) a performance data analysis, and (4) a cost analysis. (ERDA-77-32)

SUPPORTED BY U.S. Dept. of Energy, Div. of Solar Technology

4.0018, RESEARCH ON HYPERSONIC AND OTHER VISCOUS REACTIONS

M.H. Bloom, Polytechnic Inst. of New York, Long Island Center, Graduate School, Dept. of Aerospace Engin & Applied Mech, *Farmingdale, New York* 11735 (DF051110; F49620-78-C-0020)

AF function - advanced aerospace vehicles. Opportunity - increase the understanding of the mechanism of film cooling and improve the prediction and computational efficiency of viscous fluid flows. Objective - to study the effects of transpiration film cooling of slender, blunted conical bodies, both experimentally and analytically. How work contributes - this work will provide basic knowledge which can be applied to the design of the next generation of maneuverable reentry vehicles and will provide analytical tools to more efficiently utilize computer capabilities in the prediction of viscous aerodynamic flow fields.

An experimental, theoretical and analytical program to study the effects of liquid film cooling of slender blunted cones will be developed. Both zero and non-zero angle of attack effects, as well as the effect of cooling on the boundary layer transition, will be considered. A laser diagnostic system using argon-ion and one tunable dye laser will be developed to determine the concentration of water in both liquid and vapor form. The analytical studies will determine the applicability of high-order collation techniques as a tool for calculating this problem, as well as thicker, higher shear turbulent boundary layers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0019, SENSOR DEVELOPMENT

B.R. Capone, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF903640)

To reduce cost of electrooptic sensors.

New improved cameras based upon internal photoemission from Schottky barrier arrays offer the possibility of a more than ten-fold reduction in the cost of infrared thermal imaging systems. Applications of these cameras include night attack, navigation, weapons delivery, and passive non-cooperative identification and classification of aircraft. Prototype cameras are evaluated to determine their performance characteristics including resolution, temperature sensitivity, operating parameters and noise.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0020, REACTIVE LOADING ON CYLINDER

P.H. Pathak, Ohio State University, Columbus Campus, School of Engineering, Dept. of Electrical Engin, *190 N. Oval Dr., Columbus, Ohio* 43210 (DF902530; F19628-77-C-0107)

The objective of this effort is to study propagation characteristics of normal and tangential fields across dielectric surfaces to enhance strong radiation near horizon circularly polarized. Antenna systems for high-speed aircraft missiles and aircraft-to-satellite communications will be improved by the results of this work. Deficiency - a basic problem in the implementation of flush-mounted antennas used in aircraft-to-satellite communications is the difficulty of obtaining strong radiation in the endfire direction in the vicinity of the horizon. This is a major problem and obstacle to further development of full hemispherical scan capabilities of present antenna systems. How research contributes - provides antenna engineers with techniques to design flush-mounted antennas capable of hemispherical scan.

The 2-dimensional problem of reactive loading cylinders will be investigated and some new theoretical results applied to realistic variable surface curvature and variable surface impedance cases.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0021, SYSTEM DESIGN OF AVIONICS ARCHITECTURES FOR ATF

D.A. Boaz, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF110170)

The objective of this effort is to determine the cost-effectiveness of possible digital information system topologies and architectures for the advanced tactical fighter avionics with emphasis on distributed microprocessor architectures.

The approach to be taken will be to assess the ATF mission requirements and threat environment and their impact on the avionics requirement considering an IOC of the mid-80s. This effort will be augmented by contractor support in the area of software design/ standardization/cost-effectiveness as well as the ongoing ATS studies and laboratory advanced technology studies such as fiber optics, integrated tactical electronic warfare systems and all-weather tactical strike systems which are expected to have an impact on hardware and software partitioning.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0022, TIME-DEPENDENT JET FLOWS

H. Viets, Wright State University, Graduate School, *Dayton, Ohio* 45431 (DF137520; AF-AFOSR-3525-78)

This effort supports development to airborne pointing and tracking systems and advanced laser aerodynamics applications. Specifically, improved understanding of time-dependent shear flows will aid in the design of open ports for airborne applications. The present program will attack the problem of the structure of time-dependent jet flows and examine these flows in relation to the state of the art in the study of large-scale steady turbulent jets. The data generated will contribute to the effectiveness of future combat aircraft containing radiation subsystems for projection and detection in passive and active roles.

Design and construct several time-dependent nozzles, probably the acoustic feedback type. Probe the nozzle flow in detail with a hot wire anemometer. Supplement these measurements with water table flow visualization and an analytical effort of modest scale.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

4.0023, ADVANCED SONDE TECHNOLOGY

S. Grillo, U.S. Dept. of Defense, Navy, Naval Air Development Center, *Warminster, Pennsylvania* 18974 (DN881360)

Provide advanced technologies to support the development of the balloon-launched minirefraction sonde and the aircraft launched dropsonde. Both sondes provide real-time vertical refractive conditions affecting system performance (surveillance, communications, electronic warfare).

Identify current sondes weaknesses and/or areas for potential improvements. Areas already scheduled for further development are miniature, low power transmitter for dropsonde; low-cost, hands-off sensors for pressure and humidity; LSI technology for sonde electronics; expendable preprocessor input system for sensor parameters; standardization of electronics and sensors for drop and minirefraction sonde; reduced size and weight of dropsonde for use with V/STOL vehicles.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0024, MORPHOLOGY OF DESIGN OF AEROSPACE SYSTEMS WITH INCLUSION OF HUMAN RESOURCE FACTORS

B. Ostrofsky, University of Houston, School of Engineering, Dept. of Industrial & Systems Engin, *3801 Cullen Blvd., Houston, Texas* 77004 (DF049600; F49620-77-C-0116)

AF function - the system engineering/systems management procedures developed by the Air Force during the 1960's identified the philosophy and the details and implementation for Air Force systems. This documentation identified reporting details for each activity during the system life cycle and, while it left the designer free to improvise, it constrained his activities to definable and reportable categories. An improved rationale for the design of technological systems is required. Deficiency - the effects of changes or retrofits in the long-term development and acquisition of expensive, advanced technological systems must be anticipated more accurately to help eliminate significant cost overruns. Objective - the research proposed will define a decision structure required to use resources optimally in attempting to meet design objectives. How research contributes - the research resulting from this effort is intended to clarify the decision structure and methodology for the design of high-technology, large-scale Air Force systems with emphasis on integration of human resources factors and metrics.

A human factors and metric study will review recent developments in design morphology, identify relevant human factors information, clarify subjective and objective design inputs, and define areas for quantification in the evaluation of criteria. An analysis of information into a multivariate criterion function will structure an input-output matrix for each phase of an aerospace system life cycle, validate information obtained regarding criteria definition, identify aerospace system criteria conceptually, and establish the metrics for allowing assessment of the relative importance of criteria and their interactions. Clarification of methodology will define the design parameters, submodels and models of criteria, taking advantage of recent developments to structure a criterion function. Testing this function will be accomplished by using sample data. The USAF C-130 system has been selected because of readily available data and access to the design personnel.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0025, ORBITAL MECHANICS OF LARGE SPACE STRUCTURES

B.E. Schutz, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engin & Engin Mech, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: Various applications using large structures in space have been proposed including solar power stations and space colonies. Some of the proposals utilize orbits which are resonant with the moon, the sun, the earth's gravitational field, etc. As a consequence, large amplitude oscillations occur in some cases which could significantly influence the selection of particular orbits for large space structures. Current analysis is concentrating on 1) general characteristics of orbital motion in these resonant cases; 2) ascertaining the existence of small amplitude motions; and 3) the general characteristics of the rotational motion of a large structure.

SUPPORTED BY University of Texas

4.0026, NAVY ENVIRONMENT - STUDY THE POTENTIAL USE OF AN EXISTING IN-WATER TEST FACILITY TO AID IN AIRCREW SURVIVABILITY OF HELICOPTER CRASH

M.G. Every, Biotechnology Inc., *3027 Rosemary Ln., Falls Church, Virginia* (DN775279; N00014-77-C-0253)

This work unit is to evaluate the use of the undersea weapons tank at the Naval Surface Weapons Center for obtaining data on certain aspects of underwater helicopter escape. Attention will be focussed on techniques to assess clothing and equipment entanglement during emergence from the craft and on escape training procedures.

A broad range testing of underwater helicopter escape will be carried out on experienced and naive subjects in an established in-water test facility. The facility is equipped with underwater television and photographic equipment for documentation of all aspects of the tests. The initial phase of the study is to define problems associated with the operation of the test facility and obtain information to evaluate plans for further use of it. Safety guidelines also will be defined with countermeasures designed to protect the subjects.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0027, HIGH-TEMPERATURE RESISTANT THERMOPLASTIC STRUCTURAL ADHESIVE SYSTEMS
J.T. Hoggath, Boeing Co., Boeing Aerospace, *7555 E. Marginal Way S., Seattle, Washington* 98124 (DN790064; N00019-77-C-0340)

Conduct an in depth investigation under simulated service conditions, the environmental resistance and thermal stability of selected thermoplastic adhesive systems.

Expose the adhesive system to different temperatures and fluids normally used on military aircraft, determine the effect on peel strength, static creep strength and fatigue strength.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0028, NAVY VEHICLE DESIGN AND CONSTRUCTION - FINITE VOLUME METHODS FOR THREE-DIMENSIONAL TRANSONIC FLOWS
E. Murman, Flow Industires Inc., *1819 S. Central Ave., Kent, Washington* 98031 (DN875175; N00014-78-C-0079)

Accurate prediction of three-dimensional flows about wings and bodies is essential for the design of cost-effective and high-performance military aircraft. Recent developments in numerical finite volume methods have led to the potential capability of computing such flows in the complex transonic regime for realistic aircraft wing/body shapes. It is the objective of this investigation to develop this potential into a useful and effective analysis tool for use in aerodynamic research and design.

A preliminary wing/body program will be developed using a finite volume method to solve the full potential equations for a wing and a closed body with a noncircular fuselage in transonic flow. New mesh systems and mapping procedures that are under development in basic research programs will be incorporated in the program. Aerodynamic forces and moments for example cases will be computed to assess the accuracy of the method.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0029, CALCULATION OF TRAIN AERODYNAMIC DRAG (FOR ENERGY MANAGEMENT PROGRAM)
O. Colavincenzo, Ontario Ministry of Transportation & Com., *1201 Wilson Ave., M3M 1J8, Downsview, Ontario, Canada* (128041 (HRB NO.))

The purpose of this project is to: 1. Calculate the steady and unsteady aerodynamic drag of vehicles in tunnels and free air. 2. Modify and/or develop computer programs for the calculation of the aerodynamic drag of vehicles as required by the energy management program. A literature survey and review of the aerodynamics of trains in tunnels under project 3603 is well underway. Also, a computer program has been acquired to estimate the unsteady aerodynamic drag of vehicles in tunnels. With this program, it is now possible to start to perform the drag calculations for the purpose of obtaining preliminary power profile and energy loss estimates. It is anticipated that the program will have to be modified to incorporate the latest information obtained in the literature review. This project covers the calculation of aerodynamic drag for the three cases of deep tunnel, cut and cover, and free air, and studies on propulsion systems with and without energy storage. The result, conceptual designs on a total energy basis.

SUPPORTED BY Ontario Ministry of Transportation & Communications

4.0030, APPLICATION OF FUNCTIONAL ANALYSIS IN FLUID MECHANICS
L. Napolitano, Universita degli Studi di Napoli, *1 Corso Umberto, Naples, Italy* (DF051250; AF-AFOSR-3484-78)

AF function - aerospace vehicles. Opportunity- future Air Force aerospace vehicles will be required to fly at high speeds and have an ability to maneuver at these speeds with increased efficiency. This will require that new and improved engineering design and analysis methods be developed throughout the total regime for the precise engineering determination of the performance and system capabilities of those vehicles. Objective - this research will attempt to develop new methods for fluid dynamical analysis using high-speed computers, methods which should circumvent the disadvantages of currently employed machine algorithms. How work contributes - the great success of the finite element method in solid mechanical problems will require the application of functional analysis to unify the many treatments in the literature.

This research will systematically apply functional analysis to the development of finite element techniques for the solution of fluid mechanical problems, thereby unifying the many treatments in the literature that now appear superficially different and framing into a clearly defined context the problems and questions that still remain to be resolved before finite element methods can be employed rigorously and economically in fluid mechanical analysis.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, LABORATORY ABSORPTION MEASUREMENTS
D.E. Burch, Ford Aerospace & Comm. Corp., *Ford Rd., Newport Beach, California* 92663 (DF248060; F19628-76-C-0302)

AF function - surveillance satellite, meteorological satellite. Direct support of ARPA/STO programs. Deficiency - lack of knowledge of infrared absorption properties of the atmosphere. Objective - conduct laboratory measurements. How research contributes - specific atmospheric molecular absorption bands are being studied in order to provide fundamental spectroscopic data for inclusion in comprehensive data compilation.

Laboratory measurements of absorption by various atmospheric gases will be made in order to establish the fundamental spectroscopic data required to calculate the absorption over a path in the real atmosphere. Emphasis will be placed on long path measurements in weakly absorbing regions and on the temperature and pressure dependence of absorption over shorter paths.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0002, NAVY ENVIRONMENT - MARINE ATMOSPHERIC AEROSOL
M. Griggs, Science Applications Inc., *1200 Prospect St., La Jolla, California* 92037 (DN775510; N00014-77-C-0489)

Determine the atmospheric aerosol optical thickness over the ocean in order to validate a technique which will provide daily global maps of aerosol isopleths over the ocean.

By coordinating ground truth observations (made from the USNS Hayes during her spring 1977 electrooptical meteorology (EO/MET) research cruise) with measurements made from satellites approximately at the Hayes' zenith, determine the earth's atmospheric aerosols burden by relating the upwelling visible radiance measured by satellite to the aerosol optical thickness of the atmosphere. This technique, based on LANDSAT data, can be expanded to such existing satellites as NOAA, DMSP and GOES.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0003, REMOTE SENSING AS A SOURCE OF DATA FOR STATE AND LOCAL AGENCIES
E. Maxwell, Colorado State University, School of Forestry & Natural Resources, Dept. of Earth Resources, *Fort Collins, Colorado* 80523 (0073828; COL00016)

OBJECTIVE: Compare remote sensing to more conventional modes of data collection; determine data adequacy and cost-effectiveness of various methods of processing remote sensing data; work with various state agencies to determine data needs and to evaluate opportunities to meet data needs with remote sensing methods; evaluate organizations and equipment for possible use in providing the state with the image processing capabilities.

APPROACH: This project will be carried out by maintaining close working relations with interested state and local agencies. Specific problem areas identifiable at this time include: Drought assessment, conversion of ag land, monitoring agricultural production, mapping land use and obtaining ag statistics on an annual basis as a problem alert system. Various remote sensing systems and data processing methods will be considered for each application.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Colorado

5.0004, SEASAT

L. Fedor, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (8B326351)

PROJECT OBJECTIVE: 1. To develop and test techniques for measurement of sea state using the satellite altimeter. 2. To assist in analysis and interpretation of real and synthetic aperture images of ocean waves as they impact on the SEASAT instrument. 3. To participate in SEASAT committees and workshops which provide guidance in the effective utilization of the radar instruments.

CURRENT YEAR PLAN: 1. Verify algorithms on initial data from the SEASAT-A altimeter. 2. Study effect of large scale surface features on radar pulse returns and estimates of sea state especially in regions of strong surface currents. 3. Comparison of significant wave height determinations with surface truths especially for tracking of severe storms. 4. To develop and analyze techniques for interpretation of imagery radar wave records. 5. To participate in SEASAT committees, workshops, and joint experiments with AOML.

PROGRESS REPORT: Successful completion of algorithm development. Altimeter measurement workshop to be held in Boulder 2/26 through 3/3/78, to intercompare algorithms and develop standards to be applied to SEASAT-A altimeters.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0005, C-130 MAINTENANCE

J.D. McFadden, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (8G172141)

PROJECT OBJECTIVE: Provide for maintenance on C-130 aircraft. Regularly scheduled checks; engine and prop changes; structural repair; tires; navigation and aircraft electronic systems; spare parts required to carry our maintenance procedures.

CURRENT YEAR PLAN: To maintain WC-130B in a high state of readiness for hurricane research and reconnaissance missions, oceanographic and air-sea interaction flights and fisheries research programs, through an intensive maintenance program that includes daily and 200 hour inspections, engine performance, run-ups and aviation electronics and navigation systems flight tests. To perform program depot maintenance (overhaul) on WC-130B at Hayes International Co., Birmingham, Ala.

PROGRESS REPORT: Normal maintenance and inspections accomplished.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0006, SATELLITE RAIN ESTIMATE

W.L. Woodley, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (RG140778)

PROJECT OBJECTIVE: Adaptation to mid-latitudes of a computer-automated techniques to estimate convective rainfall from geosynchronous digital visible and infrared satellite imagery. The initial focus is the HIPLEX sites in the U.S. High Plains.

CURRENT YEAR PLAN: Satellite rain estimates will be made for selected days at the HIPLEX sites using the techniques exactly as it was developed in Florida. Once completed, the deficiencies of the method for mid-latitude rain estimates will be identified and the method can then be modified to correct these deficiencies.

SUPPORTED BY U.S. Dept. of the Interior, Bureau of Reclamation

5.0007, GEOCHEMICAL TECHNIQUES IN URANIUM EXPLORATION

R.A. Cadigan, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9440-01357)

This project will attempt to develop and field test new geochemical techniques using commercially available equipment, and where necessary, to modify existing equipment, or develop new equipment. Procedures will be designed to detect anomalous chemical, mineralogic, and isotopic indications of uranium mineral deposits where present in rocks, streams, subsurface water, soil, decayed plant material, vegetation, soil gases, and from remotely sensed the LANDSAT spectral imaging. This research in techniques will be combined with computerized statistical analysis and manipulation of geochemical exploration and research data from our own field studies, from other U.S.G.S. published and unpublished data, and from published data of the Department of Energy NURE.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0008, GEOLOGY OF THE CEDAR CITY 2 DEGREES QUADRANGLE, UTAH

K.A. Sargent, U.S. Dept. of the Interior, Geological Survey, Central Environ Geology Branch, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9530-02027)

STATES TO WHICH PROJECT PERTAINS: Utah.

Estabish contacts with workers in Geologic, Conservation, and Water Resources Divisions and others at private, state, and local levels. Obtain base materials (topographic sheets, base maps, and aerial photographs) of area. Compile existing geology at 1:125,000 and field-check the data.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0009, REMOTE SENSING - GEOTHERMAL

K. Watson, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9790-00922)

To extend the use of theoretical thermal model to more complex geological situations including topographic and surface roughness effects, to develop the computer methodology for registration to aircraft images acquired at different times in diurnal cycle and to complete aircraft-scanner modifications for navigation, spectral response and multichannel digitizing.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0010, THERMAL MODELING INVESTIGATIONS

K. Watson, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9790-01703)

To extend the theoretical thermal model to more complex geological situations including topographic and surface roughness effects, to develop the computer methodology for registration of aircraft images acquired at different times in diurnal cycle and to complete aircraft/scanner modifications for navigation, spectral response and multichannel digitizing.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0011, DEVELOPMENT OF INTRODUCTORY COURSE IN REMOTE SENSING AND INTERPRETATION AND ANALYSIS

C.A. Budelsky, Southern Illinois University, Carbondale Campus, School of Agriculture, Dept. of Forestry, *Carbondale, Illinois* 62901 (SER78-00010)

This project is designed to provide an opportunity for undergraduate students, majoring in the natural resource sciences at Southern Illinois University, to develop functional skills in remote sensing techniques. Remote sensing has been shown to provide significant advantages in collecting and interpreting inventory data over large geographical areas at a substantial reduction in time and expense.

An introductory course will be developed, utilizing the facilities of a currently acquired remote sensing laboratory, to increase the assortment of inventory and diagnostic skills that are needed by students of the natural sciences. The multidisciplinary nature of the student enrollment will be utilized to enhance the development of all class members. Faculty representatives of several departments and undergraduate students will function in an advisory capacity to identify pertinent topics for inclusion, so that the presentation will be relevant to the needs of the students. Consultants from the University's Learning Resource Center and from other institutions currently offering programs in remote sensing will provide an evaluation of course content, presentations and laboratory exercises.

SUPPORTED BY U.S. National Science Foundation, Div. of Science Education Resources Improvement

5.0012, DEVELOPMENT OF IMPROVED MONITORING EQUIPMENT FOR ON-LINE DETECTION AND CHARACTERIZATION OF AIRBORNE PLUTONIUM AEROSOLS

T.J. Yule, U.S. Dept. of Energy, Argonne National Lab., *9700 S. Cass Ave., Argonne, Illinois* 60439 (001762)

Improved sensitivity and reliability over presently available monitors will be achieved by improving the discrimination against natural background activity by utilizing improved mechanical and electronic separation schemes. Prototypical monitors will be constructed and tested under laboratory and field conditions. New techniques will be developed and existing techniques evaluated for determining the activity and aerodynamic particle-size distributions of plutonium aerosols. Development of on-line airborne plutonium monitors which will be able to rapidly and reliably detect small concentrations of airborne plutonium. Development of techniques to determine the characteristics of a plutonium aerosol. (1) Establish the basis for design of an on-line airborne plutonium monitor, Sept. 30, 1977. (2) Fabricate and test airborne plutonium monitor prototype suitable for commercial development, Sept. 30, 1979.

SUPPORTED BY U.S. Dept. of Energy, Div. of Biomedical & Environmental Research

5.0013, CHANNEL MORPHOLOGY, STREAM POWER, AND SEDIMENT TYPES AS RELATED TO CHANNELIZATION AND RIVER TRAINING

W.N. Melhorn, Purdue University, U.S. Dept. of Agriculture Water Resources Research Center, Dept. of Geosciences, *Executive Bldg., West Lafayette, Indiana* 47907 (A-035-IND)

Stream power incorporates the variables of slope and discharge and has a definite influence on the size and shape of the river channel. This project will investigate the relationship of these variables on channel dimensions. Specific objectives for the research are (1) define the relationships between stream channel morphology and stream power for differing bed and bank materials; (2) refine relationships developed in Objective 1 and thus develop a series of curves and nomographs which relate channel dimensions to stream power, discharge, and slope for a given bed and bank material type; and (3) determine the effects of channel alteration in a given stream reach to channel and drainage basin stability both above and below the reach in question. Data will be obtained from topographic maps and aerial photographs and in the field. In the field, variables such as channel width, depth, bar location, cross-section profile, and pool-riffle spacing will be measured. The research will be primarily devoted to streams in Indiana, but will also investigate data from the Mississippi and the High Plains states.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0014, EOMET AND MARINE FOG FIELD INVESTIGATIONS IN THE GULF OF MEXICO

J.B. Russell, U.S. Dept. of Defense, Navy, Naval Avionics Facility, *Indianapolis, Indiana* 46218 (DN797002)

To investigate the atmospheric marine boundary layer in order to provide an understanding of its influence on the propagation of electromagnetic radiation and on the formation, maintenance, and dissipation of marine fog.

Meteorological, micrometeorological, and microphysical measurements in the marine boundary layer, as well as oceanographic measurements, will be made. Most measurements will be made from a fixed platform approximately 12 miles off the coast of Panama City, FL. Supplementary measurements will be made on shore, from chartered vessel, from aircraft, and from satellite. NAFI will provide instrumentation for the direct measurement of the structure function parameter C(2) sub T, momentum flux, and microwave refractive index, as well as measurements of wind, temperature and pressure. Calspan, under contract to NAFI, will provide measurements of visibility, fog droplet size distribution, aerosol concentration, temperature, and humidity. It will also participate with NAFI in a laser imagery experiment. Radiosondes will be launched at least twice a day. Measurements of wave height, currents, sea surface temperature and some meteorological variables will be provided by NCSL. Data consisting of sea surface temperature and STD profiles will be obtained from a chartered vessel. Wet bulb/dry bulb temperatures and wind will be measured to 1 km using tethersonde. Continuous acoustic sounder data will be available from a sounder located on the 12 mile platform. Satellite SMS pictures will be obtained. Much of this latter data will be obtained by scheduling the investigation to coincide with other cooperating investigators.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0015, SEVERE LOCAL STORMS PREDICTION

M.A. Alaka, U.S. Dept. of Commerce, Techniques Development Lab., *Silver Spring, Maryland* 20910 (8C3781)

TECHNICAL OBJECTIVE: To develop automated techniques for predicting thunderstorms and severe local weather (tornadoes, hail and damaging winds) for periods up to 24 hours. Products will be adapted to the NWS operational environment and will provide guidance to the NSSFC and local public weather and aviation forecasters.

APPROACH: 1. Apply MOS techniques to generate objective 12-48 hr probability forecasts of thunderstorms and severe local weather from the output of current and future operational MHC and TDL models. 2. Apply a combination of MOS and classical statistics to generate 2-6 hr forecasts of the same phenomenon. 3. Make use of radar observations, alone or in conjunction with other meteorological information, to develop corresponding forecasts in the 0-2 hr range. 4. Develop a boundary layer model for more accurate prediction of parameters germane to severe local weather.

PROGRESS: 1. Medium-Range Forecasting: In the area of medium-range forecasting, TDL has developed new multiple regression equations to predict the probability of both general and severe thunderstorms 12-36 hr in advance. The 1977 operational equations also included a separate forecast equation to give conditional probabilities for major or family tornado outbreaks. Nearing completion are improvements to the TDL trajectory model which incorporate the near-surface diurnal temperature variation. 2. Short-range Forecasting: In the 2-6 hr prediction effort, TDL has developed and implemented improved prediction equations, and expanded the number of operational forecasts from three to four daily. 3. Very-Short Range Forecasting (radar techniques): Several techniques of varying complexity were tested for their comparative effectiveness in forecasting echo motion. The best relationships between severe weather and different configuration of digitized radar data were obtained from parameters based on a combination of ZTR and VIL values. A start was made on developing techniques to forecast the probability of thunderstorms for short time intervals. 4. Boundary Layer Model (BLM): TDL has developed and is now running semi-operationally a three-dimensional numerical forecast model of the planetary boundary layer. Detailed forecasts of wind, temperature and humidity are made for the atmosphere's lowest 2 km for

a period of up to 24 hr. The model's forecast grid covers most of the U.S. east of the Rocky Mountains.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service

5.0016, RIOMETER STUDIES OF PARTICLE PRECIPITATION IN THE VICINITY OF PLASMAPAUSE

T.J. Rosenberg, University of Maryland, College Park Campus, Inst. for Physical Science & Technology, *College Park, Maryland* 20742 (ATM77-22937)

This grant will support the installation of a meridional chain of fast-response riometers covering a region from 'magnetic latitude' L equals approximately 3.2 to L equals approximately 4.4 in the northern hemisphere in conjunction with an already operational meridional chain of magnetometer stations. Both sets of data would be acquired digitally in computer-compatible formats. The measurements would be carried out in the area conjugate to Siple Station, Antarctica and would cover most of the range of L values over which the Siple VLF transmitter may act to precipitate particles. Avenues of investigation would include substorm morphology at middle latitudes, the relationship of electron precipitation to the plasmapause and to hydromagnetic wave phenomena and irregular magnetic activity, precipitation associated with transient and oscillatory phenomena observed in VLF propagation, and the search for precipitation stimulated artificially. Further, it is intended to re-examine the multi-frequency riometer technique for inferring relative changes of precipitated energy spectrum as a means of possibly identifying plasmapause position. This research would contribute substantially to the goals of the International Magnetosphere Study (IMS) as related to plasmapause studies and particle precipitation phenomena, including the active stimulation of precipitation through wave-particle interactions.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0017, IONOSPHERIC VARIABILITY

M.J. Mendillo, Boston University, School of Engineering, Dept. of Astronautics, *755 Commonwealth Ave., Boston, Massachusetts* 02215 (DF249900; F19628-77-C-0270)

AF function - radio frequency ranging systems for navigation and satellite detection and tracking. Deficiency - monthly average models are available for correcting for the effects of the earth's ionosphere on the velocity of radio waves. However, on a day-to-day basis, the models have errors of up to 25 percent RMS. The effect on the ionosphere of large magnetic storms has been studied, and can be corrected for to first order. Other variations occur which are not yet understood yet which cause large errors from average conditions. Objective - study the day-to-day variability of the ionospheric f region to develop algorithms to improve models of ionospheric time delay. How research contributes - results will improve existing models of the time delay to operational radar and navigation systems, and will require the use of fewer monitoring stations to update ionospheric conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0018, PHOTOMETRIC ROCKET PAYLOAD

I.L. Kofsky, Photometrics Inc., *Lexington, Massachusetts* 02173 (DF581630; F19628-77-C-0124)

AF function - surveillance or communication satellites. Deficiency - electrical charging of satellites causes failure of on-board electrons components. Objective - development and flight on a sounding rocket payload of a camera system to record arcing due to induced electrical charging. How research contributes - by determining the frequency and nature of arcs due to charge ejection, information will be obtained on the processes controlling the charging of space vehicles. This information will be used to develop instrumentation to control and reduce satellite spacecraft charging.

A camera system is to be developed and constructed for use on a recoverable charge ejection sounding rocket payload. The camera will have the purpose of photographing arcs through the plasma sheath to the payload skin caused by large potential differences between the payload ground and the ambient plasma. The camera will also have the purpose of recording arcs between the charged and uncharged segments of the payload skin.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0019, ADVANCED WEATHER RADAR DIAGNOSTIC SOFTWARE

C.L. Bjerkaas, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581480)

AF function - protection of aerospace systems in severe storms. Deficiency - identification and warning of storm hazard by current methods are unreliable and require ineffective utilization of projected reduced manpower. Objective - to develop software suitable for the operational detection of meteorologically significant features of storms and the prediction of storm movement, development, and severity. How development contributes - provides improved identification and prediction of convective storm hazards using automated data processing techniques for storm diagnosis.

Algorithms for detecting radar indicators of severe weather phenomena will be developed based on radar data taken in Oklahoma during the joint agency Doppler tests in the spring of 1977. The algorithms will be operationally tested during the spring 1978 test and modified based on the test results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0020, REMOTE WIND-SENSING TECHNIQUES

F.J. Brousaides, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581610)

AF function - navigation, weapons delivery, command and control. Deficiency - lack of capability to detect low level wind shears that are hazardous to Air Force operations. Objective - to evaluate techniques for remote sensing of winds. How development contributes - development will lead to a technique for remotely measuring vertical wind shear.

An evaluation of a Lockheed laser Doppler velocimeter and the AFGL acoustic doppler wind sensor will be made. Wind data from these two remote sensors collected at the Weather Test Facility at Otis AFB will be compared with wind measurements obtained from sensors mounted on a 200-foot tower. A continual search of the literature will be made to keep abreast of new developments in remote wind sensing.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0021, EMULSION PACKAGE FOR SPACE SHUTTLE

R.C. Filz, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580730)

AF function - communications and survivability. Deficiency or opportunity - improved prediction of space radiation resulting in improved prediction of spacecraft systems life-cycle cost. Objective -to design, construct, and space qualify the long duration exposure emulsion package (LDEEP) for the LDEF space shuttle flight. How research contributes - provides definitive data on low energy trapped particle fluxes required to improve models of the radiation environment in space.

A special nuclear emulsion sliding plate mechanism will be designed to obtain daily observations of 1 to 100 Mev trapped proton fluxes over the six-month lifetime of the LDEF flight. Special techniques will be developed to shield the emulsion from background. Emulsions will be selected and calibrated for use with six-month space exposure. Mechanical and electronic devices will be designed, constructed and space qualified.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0022, MM RADIOMETER IMPROVEMENT
D.A. Guidice, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580840)

AF function - communications and surveillance. Deficiency - techniques to forecast the proton energy spectra of solar flare-bursts require sensitive mm-wavelength observations. Present mm instrumentation (35 gHz) at Sagamore Hill is below state-of-the-art, a 35 gHz radiometer was not included in current RSTN equipment. Objective - to upgrade the Sagamore Hill mm-wavelength patrol equipment to improve sensitivity; this will then serve as the baseline for other RSTN units as needed. How research contributes - equipment upgrading and resulting improved sensitivity will lead to a more complete utilization of collected data for prediction.

The approach is to investigate the suitability, procure, test, and incorporate wide-band (greater than 100 mHz) intermediate-frequency components into the Sagamore Hill mm-wavelength radiometric instrumentation. Sensitivity will also be improved by incorporating suitable low-noise and/or low-loss waveguide components into the existing radiometer.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0023, IONOSPHERIC MONITORING TECHNIQUE REFINEMENT
W.N. Hall, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580960)

AF function - communications, surveillance and navigation at high altitudes. Deficiency or opportunity - ground-based ionospheric and geophysical data inputs to the Space Environmental Support System (SESS) are being squeezed by increasing costs and decreasing resources. Objective - to develop methods to transform remote ground-based ionospheric and geophysical measurements into forms suitable for convenient, automatic use by SESS and Air Force systems. How research contributes - automation of the functions of AF and contractor observers would reduce the cost of acquiring ground-based ionospheric and geophysical data inputs to SESS. Automation would counteract recent cost increases, prevent further loss of ground-based data sources, and increase the quantity and quality of ionospheric and geophysical data input to SESS.

The procedures used by the observers for reducing and reporting sess data will be defined and analyzed. Analytical algorithms for automating the data reduction will be developed by computer simulation. The analytical algorithms will then be adapted for implementation in firmware in microprocessor based systems. The geomonitor now in operation at the AFGL Goose Bay Ionospheric Observatory will be used for trial operations and for development of techniques for the automated communication of the data to the AF Global Weather Central (AFGWC). The use of the existing astrogeophysical teletype network and the formatting of the data messages in the same format used by the observers will require no changes at AFGWC to utilize the automatically reduced SESS data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0024, INVESTIGATION OF 15 MICRON SATELLITE DISCREPANCY
R.A. McClatchey, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580300)

AF function - weather forecasting, weapons delivery, surveillance. Deficiency - inability to adequately utilize satellite radiances in remote sounding of temperature and moisture. Objective - investigate sources of uncertainty in the calculation of radiances in the 15 micron carbon dioxide band. How research contributes - improves the ability to analyze and forecast atmospheric parameters of importance to military operations, particularly over data-sparse or data-denied areas.

Laboratory measurements of the 15 micron carbon dioxide transmittance will be analyzed with the object of establishing a more accurate transmittance calculation technique in this spectral region. Modified transmittances will be used to revise radiance calculations for comparison with satellite measurements. An experimental program will be carried out to study the relationship between radiometric temperature measurements and radiosonde data as a potential source of discrepancy between satellite measurements and ground truth calculations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0025, COMPARISON OF ROCKET END DMSP DENSITY DATA
C.R. Philbrick, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581230)

AF function - low-altitude operational satellites, airborne surveillance and ballistic weapon delivery. Deficiency - inadequate density data base at critical altitudes. Require improvement in computational accuracy of ephemerides for low-altitude operational satellite and ICBM trajectories. Objective - provide calibration data for DMSP satellite with onboard SSD package used to determine density on a global scale. How research contributes - in situ rocketborne density measurements made during satellite pass will enable significant intercomparison of observations to be made with the remote sensing technique of the supplementary density sensor (SSD).

PZL densitometer (10 inch falling sphere) payloads will be launched at an appropriate time during a pass of a DMSP satellite with an onboard SSD package for remotely sensing density. Near-simultaneous rocketborne measurements of composition, optical emissions and solar EUV will also be made and the acquired data will be analyzed to assist in the evaluation of data from the DMSP/SSD package and to study the thermospheric heating sources and energy balance.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0026, NITRIC OXIDE VARIABILITY IN THE MESOSPHERE AND LOWER THERMOSPHERE
W. Swider, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581120)

AF function - communications, surveillance and detection. Deficiency - inadequate knowledge of the nitric oxide concentration in the upper atmosphere. Objective - to provide better information on the distribution of nitric oxide at 80-200 km as a function of time, latitude and solar activity. How research contributes - nitric oxide is important to the ionic structure and is an IR emitter. Improved models of nitric oxide ionization variability at 80-200 km will help communication codes for computing transmission paths/absorption for LF-VHF. Improved models of nitric oxide variability will help also with Air Force IR surveillance and detection capabilities.

Ionic data measured by LKD and groups outside of AFGL will be compared with models developed in-house. Nitric oxide profiles will be derived from the requirement of reaching agreement between the model/models and data. The relationship, if any, between nitric oxide variability and plasma instabilities (scintillations) will be investigated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0027, MICROPULSATION RESEARCH AT SIPLE, ANTARCTICA, AND ROBERVAL, QUEBEC, CANADA
L.J. Cahill, University of Minnesota, Minneapolis Campus, Space Science Center, *Morrill Hall, Minneapolis, Minnesota* 55455 (DPP77-21924)

Search-coil magnetometers will be operated at the geomagnetically conjugate stations at Siple, Antarctica, and Roberval, Quebec, Canada, which are ideally situated for micropulsation studies in that they are 'quiet sites' and are at magnetic latitudes well situated for exploration of the plasmapause region of the earth's magnetosphere. In 1978 the Siple magnetometer will be temporarily shut down while the system is upgraded. It will resume operation in December 1978.

The micropulsation data obtained with the magnetometers at Siple and Roberval along with data obtained by other ground-

based passive and active techniques and by satellites will be used to study 1. the generation and propagation of micropulsations, 2. the propagation of micropulsation through the ionosphere under varying seasonal solar and local time conditions, 3. the dispersive properties of the magnetospheric medium, and 4. the stimulation of micropulsations by the VLF transmitter at Siple.

Field support at Siple Station is required for one person during the austral summer of 1978/79.

SUPPORTED BY U.S. National Science Foundation, Div. of Polar Programs

5.0028, REMOTE SENSING LABORATORY

M.P. Meyer, University of Minnesota, St. Paul Campus, School of Forestry, Dept. of Forest Resources, *301 Green Hall, St. Paul, Minnesota* 55108 (0065906; MIN-42-033)

OBJECTIVE: Reduce the time and costs necessary with current ground methods to monitor features essential to research and to practical resource management.

APPROACH: As the time of an overflight request for remote sensing project support, the needs will be determined in cooperation with the project leader and the flight plan developed. Following overflight, the film will be catalogued, interpretation plan set up and the data gathered and analyzed.

PROGRESS: A practical method of utilizing 35 mm color infrared aerial photography to prepare photomosaics of forest fires for use in suppression planning for ongoing fires and damage appraisal following suppression was tested and perfected; manuscript in progress. Revision of a 35 mm aerial photography applications manual developed in 1973 for resource managers was 50% completed.

SUPPORTED BY Minnesota State Government

5.0029, ENVIRONMENTAL INVENTORY AND ASSESSMENT IN THE YAZOO BACKWATER AREA, MISSISSIPPI

D.C. Guynn, Mississippi State University, School of Forest Resources, Dept. of Fisheries & Wildlife, *102 Experiment Station Bldg., Mississippi State, Mississippi* 39762 (0070285; MIS-0812)

OBJECTIVE: Conduct an enventory of fish and wildlife resource in the Yazoo Backwater Area. Assess the effects of the Yazo Backwater Pumping Project on fish and wildlife populations and habitats.

APPROACH: Current land use patterns, ownership categories, gross wildlife habitat types, and environmental features will be determined by use of infared imagery and ERTS Statellite Computer Image. Spot field observations will be made to insure accuracy of data. Special attention will be given to areas considered as critical habitat for threatened or endangered species. Potential threatened or endangered species will be identified using established lists. Assessment of project impact on areas of critical habitat will be made. Sites for project structures, changes in periodic flooding levels and projected changes in land use will be primary considerations. Management programs and techniques to enhance and preserve these areas will be formulated where possible.

SUPPORTED BY Mississippi State Government

5.0030, EG&G - AERIAL MEASUREMENTS PROGRAM

T.P. Stuart, E G & G Inc., *2501 Wyandotte Rd., Las Vegas, Nevada* 89114

The EG&G/DOS program provides for the maintenance of a 24-hour-a-day response to a RAP (nuclear accident call) and theremote sensing data acquisition capability necessary to provide data to help ensure that all ERDA programs and operations are conducted in a manner that will protect the public, ensure occupational safety and health, and preserve the environment in accordance with nationally accepted norms. The RAP response capability includes aircraft, electronic systems, and trained crews integrated into an Aerial Radiological Measuring System. Baseline ARMS surveys are made for licensed nuclear facilities prior to operation. The data are reduced and stored for potential use as accident assessment tools.

Continuing technical support of the ARMS program is intended to offer the necessary physics, analysis, design, development and experimental measurement support required for effective execution of survey operations and the analysis and interpretation of survey data. The program will include the assessment of present and future instrumentation requirements and availability, primary data acquisition requirements and availability, primary data acquisition requirements development of analytical data display and reporting methods and calibration techniques for data collection and interpretation.

RESULTS: Studies were conducted to find methods of simulating gamma fields from infinite planes by limited distributions of source material and shielding. A method of simulating the uncollided flux with a highly localized source distribution was developed. A review of the geological setting of several reactor sites scheduled for ARMS surveys was completed. Aerial surveys of 17 reactors and 17 government facilities were conducted during the 15 months ending Sept. 30, 1976.

SUPPORTED BY U.S. Dept. of Energy, Nevada Operations Office

5.0031, ICE FOG SUPPRESSION AND GENERATION

T.T. McFadden, U.S. Dept. of Defense, Army, Corps of Engineers, Cold Regions Research & Engineering Lab., *P.O. Box 282, Hanover, New Hampshire* 03755 (DA0E8144)

To develop equipment and techniques for suppressing fog generation caused by military operations. To develop ways to eliminate fog from winter operations where its presence shows strategic positions for miles. To develop effective means of generating the fog for concealment or decoy techniques.

Fog suppression by condensation of exhaust effluents has met with limited success. Most of the problems are within present technological capabilities. Devices for eliminating fog from vehicle exhausts will be constructed and tested on military vehicles. Modifications and redesigns will develop the devices into practical working economically feasible accessories for current vehicles. Fog generation will be accomplished using mist generation techniques combined with air movement devices.

SUPPORTED BY U.S. Dept. of Defense, Office Chief of Engineers, Corps of Engineers

5.0032, SNOW COVER ANALYSIS IN NEW ENGLAND USING LANDSAT DIGITAL DATA

C.J. Merry, U.S. Dept. of Defense, Army, Corps of Engineers, Cold Regions Research & Engineering Lab., *P.O. Box 282, Hanover, New Hampshire* 03755 (31584(3))

OBJECTIVE: To synoptically map snow cover and to determine if a relationship exists between the water equivalent of the snowpack and the associated radiance values obtained from LANDSAT computer-compatible tapes (CCT's).

APPROACH: Digital processing of selected CCT's will be accomplished to map the areal extent of snow. The next step will be to test if a relationship exists between the water equivalent of the snowpack and the associated radiance values on the LANDSAT CCT's. Snow course data in two New England watersheds will provide the ground truth to enable this comparison to be made. In addition, a newly developed microwave sensor to quantitatively assess the water equivalent of the snowpack will be tested. Landsat spectral band ratios of the radiance for selected snow course sites that provide the most reliable information for correlation to the water equivalent of snow data will be evaluated. The number of ground truth data stations required when using the CCT's for reliable prediction of water runoff associated with the snowpack will also be determined. Significant savings in costs can result if snow surveys can be accomplished using Landsat digital data rather than ground survey procedures. The results of this investigation will be presented in ETL's and technical reports for use in flood forecasting in cold regions.

SUPPORTED BY U.S. Dept. of Defense, Office Chief of Engineers, Corps of Engineers

5.0033, CHARGED AEROSOL WIND/ELECTRIC POWER GENERATOR

A.M. Marks, Marks Polarized Corp., *153-16 10th Ave., Whitestone, New York* 11357 (AER 74-18650; EG-77-C-01-4002)

The work program relates to novel charged aerosol sources for diverse applications in Heat/Electric Power Generation, weather modification, airport fog clearance, dispersed chemical reactions, and other uses; and in particular, to a Wind/Electric Power Generator deriving electric power from wind power directly without moving mechanical parts through the medium of charged water droplets introduced into the airstream from a charging electrode, the charged droplets eventually discharging to ground to complete the circuit. The wind/electric power is converted by an isobaric electrothermodynamic process occurring in the space charge field produced by the charged droplets, which are efficiently produced by novel charging devices on the charging electrode. The Wind/Electric Power Generator can be fabricated to extend across large areas of windstream to generate large electric power output at high voltage, and means are described for its conversion to standard 60Hz, 110V power. The feasibility of a Wind/Electric Power Generator has been demonstrated by the experiments. The current contract work will consist of designing, building and testing of Arrays; each Array will consist of a number of charged aerosol sources arranged in a square. The charged aerosol sources initially utilized the condensation method; subsequent Arrays employ other methods. The tests are performed on a bench model and in a wind tunnel under various atmospheric conditions; analysis of the test data will specify the operating characteristics of the Arrays and will determine design changes to be incorporated for optimized performance. The goal of this work is an Array which has an input power less than 10 percent of the output electric power generated from wind power.

ADDENDA: This project is also supported by: Marks Polarized Corp., Whitestone, N.Y. and the National Science Foundation, Washington, D.C.

SUPPORTED BY U.S. Dept. of Energy

5.0034, DESIGN STUDY FOR HIGH-PRESSURE, HIGH-FLOW CENTRIFUGAL OXYGEN COMPRESSOR

A.O. White, Mechanical Technology Inc., *968 Albany Shaker Rd., Latham, New York* 12110 (EX-76-C-01-2366)

This project includes the following work: Conduct a design study for a multistage centrifugal oxygen compressor that will safely compress 50,000 SCFM of 98 percent purity oxygen from atmospheric pressure to 1500 psig. Use available oxygen compressor design information and combine it with the results of materials research conducted previously by NASA and currently being conducted under ERDA contract. Deliver a conceptual design consisting of layout drawings and a design study that includes the details of the theories, assumptions, and evaluations of the results of the following design parameters: cycle analysis and aerodynamics design, rotor and bearing dynamics, thrust balance, bearings, thermal analyses, seals, mechanical configurations, stress, control, material, and manufacturability. Following preliminary approval of the design study by ERDA, conduct a seminar for compressor manufacturers, oxygen users and producers, coal conversion plant designers, and others selected by ERDA. (FE-TIMS)

SUPPORTED BY U.S. Dept. of Energy, Div. of Coal Conversion & Utilization

5.0035, AIRCRAFT MEASUREMENT IN SUPPORT OF AEROSOL RESEARCH STUDIES OF SULFUR TRANSFORMATION AND TRANSPORT

Unknown, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab., *Research Triangle Park, North Carolina* 27711 (G603A-AH-17)

Organic field studies and perform aerial sampling to determine SO2 conversion rates in power plant and urban plumes.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0036, OPERATIONAL MARINE DATA DISPLAY

W.H. Quinn, Oregon State Higher Education System, Oregon State University, School of Oceanography, *126 Agricultural Hall, Corvallis, Oregon* 97331 (A/CM-11)

OBJECTIVES: The prediction of hazardous sea and harbor entrance conditions to avoid loss of human lives and property has been a major concern of marine users throughout history. Today, accurate forecasts of coastal sea conditions and fog depend on the availability of timely and reliable wave height and sea temperature data. This project, in coordination with U.S. Coast Guard and the National Weather Service, (NWS) is designed to increase the safety, efficiency and convenience of commercial and recreational marine activities along the Pacific Northwest coast by improving: (1) Observations and forecasts of coastal marine environmental conditions and (2) dissemination of marine observational data to user groups by means of existing landline, radio and television networks. Specific objectives are: (1) To provide an operational display of wave height and sea temperature data on public cable television weather channels in either analog or digital format; (2) to develop sea temperature sensing and reporting capabilities at six Coast Guard wavemeter stations for relay to users and NWS via existing teletype links; (3) to interface the wavemeter and sea temperature sensors within the NWS automatic data reporting system; (4) to improve the existing swellmeter as an aid to the NWS wave forecasting service for the Pacific Northwest coastal region; (5) to compare wavemeter and National Data Buoy Office (NDBO) buoy wave data in order to set buoy gains, and to provide sea temperature data as ground truth for the National Environmental Satellite Service (NESS) satellite tests; and (6) to continue NWS forecaster training and Oregon State University Sea Grant project marine meteorological and climatological support.

ANTICIPATED BENEFITS: (1) Wave forecasting capabilities developed in two prior Sea Grant projects are helping the NWS improve forecasts of sea conditions along the Washington and Oregon coasts. Swellmeter data will allow the NWS to make better wave forecasts. (2) Develop the capability to measure sea temperatures will allow NWS to make more precise coastal fog and stratus forecasts. (3) Coupling public television displays of wave and sea temperature conditions with improved forecasts will enable boat operators to make better and safer operational and planning decisions.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Sea Grant Office

5.0037, SPECIAL FOREIGN CURRENCY AWARD (INCLUDING EGYPTIAN POUNDS) FOR CONTINENTAL BREAKUP AND THE EVOLUTION OF RIFTED MARGINS

W.H. Kanes, University of South Carolina, School of Science & Mathematics, Dept. of Geology, *Admin. Bldg., Room 115, Columbia, South Carolina* 29208 (INT75-07943 A04)

This is a continuation of research supported under NSF Grant INT75-07943.

This research is designed primarily to provide data on the sequence of events that lead to continental breakup and the evolution of rifted continental margins. The area of study is in the Eastern Desert of Egypt, between the Nile River and the Red Sea. The Red Sea is an oceanic rift across which the Arabian Peninsula and northeast Africa have spread apart during middle and late Cenozoic time. The project aims at interpreting the history of igneous, sedimentary, and tectonic events that affected the rocks of the Eastern Desert area and that may have controlled the position and timing of the present episode of spreading in the Red Sea. The events to be investigated include a Precambrian spreading episode, more than a billion years ago; a late Precambrian period of igneous activity which involved deposition of thick sequences of volcanic rocks in fault troughs and the diapiric intrusion of granites, about 600 to 700 million years ago; and a Cretaceous event involving volcanic activity, granitic intrusions, and possible doming and fracturing that preceded the Cenozoic rifting.

The study is a collaborative effort of U.S. and Egyptian scientists and involves field mapping and geophysical surveys combined with geochemical, geochronological, paleomagnetic, and remote-sensing studies in the laboratory. The work is expected to produce data on the geological history of the Southwestern Red Sea margin that will add to the understanding of initial stages in sea-floor spreading.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

5.0038, EVALUATION OF ENVIRONMENTAL MONITORS

C.D. Scott, U.S. Dept. of Energy, Oak Ridge National Lab., *P.O. Box X, Oak Ridge, Tennessee* 37830 (4103)

Identify specific environmental pollutants associated with coal conversion processes and then develop automated environmental systems for continuous in-situ monitoring of specific airborne or soluble pollutants. An evaluation of automated instrumentation and development of such instrumentation will be pursued. The results of this program should permit the development of rapid, accurate, and automated analytical instrumentation for monitoring pollutants from coal conversion processes. Quarterly reports describing progress and the development of automated analyzers.

SUPPORTED BY U.S. Dept. of Energy, Div. of Biomedical & Environmental Research

5.0039, CANYON SAND EXPLOSIVE FRACTURING PROGRAM

S.J. Larocca, Petroleum Technology Corp., *Redmond, Washington* 98052 (E(26-1)-687)

The objective of this project is to demonstrate the technical and economic feasibility of chemical explosive fracturing technology as an effective means of stimulating gas production from the low-permeability Canyon Sand Formation. Individual assessments of lineament analysis from LANDSAT imagery and production from surrounding wells in the area over two quadrangles in Sutton County, Texas were initiated. Results of the preliminary survey will form the basis for consideration of well locations in the available leases for the programmed tests. Efforts are directed at increasing the probability of interconnecting subsurface fracture systems by chemical liquid explosives. (BERC-77/1)

SUPPORTED BY U.S. Dept. of Energy, Morgantown Energy Research Center

5.0040, PRECIPITATION SCAVENGING IN MAP3S

J.M. Hales, U.S. Dept. of Energy, Battelle Pacific Northwest Lab., *P.O. Box 999, Richland, Washington* 99352 (1655)

Four tasks will be performed in order to accomplish the goals of this project. These are: (1) The specification of wet transformation rates and the concurrent meteorological conditions for the conversion of SO/sub 2/ to sulfate. (2) The analysis of the movement of air pollution in frontal storms. (3) The prediction of wet removal of pollutants from the atmosphere. (4) The acquisition of reliable, high quality precipitation chemistry data. References: (1) Davis, W.E., and L.L. Wendell, Some Effects of Isentropic Vertical Motion Simulation on a Regional Scale Quasi Lagrangian Air Quality Model, in the proceeding of the Third Symposium on Atmospheric Turbulence, Diffusion, and Air Quality, October 1976. (2) Kreitzberg, C.W., D.J. Perkey, and J.E. Pinkerton, Mesoscale Modeling, Forecasting, and Remote Sensing Research, AFCRL-TH-74-0253, 1974. (3) Lavoie, R.L., A Mesoscale Numerical Model of Lake-Effect Storms, J. Atmos. Sci., 29, pp. 1025-1040, 1972.A series of 7 precipitation chemistry sites were established and data are being routinely generated and disseminated. A series of lake effects storms field experiments were conducted over Lake Michigan and data are being analyzed. Wet Transformation Task-Milestones for FY 1977 are: (1) Installation of instrumentation and samples for study of SO/sub 2//SO/sub 4/ (ratio downwind of a coal-fired power plant). 1 December 1976. (2) Completion of feasibility study on fabrication of a separator for sampling sulfur dioxide and sulfate in the air and in the suspended droplets. 1 April 1977. Air Pollution Trajectory Methods Task-Milestones for FY 1977 are: (1) To complete comparison of model using average temperatures and wind with model using observed data. 1 November 1976. (2) To incorporate an average radiational cooling submodel. 1 June 1977. Precipitation Scavenging Task-Milestones for FY 1977 are: (1) Decision on the type and location of a precipitation scavenging field experiment during the winter of FY 1977. 15 October 1976. (2) Completion of field experiments and formulation of the Lavoie model. 1 March 1977. (3) Completion of initial wind tunnel or tandem aircraft tests for sizing aerosol tracers. (Text Abridged)

SUPPORTED BY U.S. Dept. of Energy, Div. of Biomedical & Environmental Research

5.0041, REMOTE EM SENSING OF UNDERGROUND COAL BURNS

E.A. Quincy, University of Wyoming, School of Engineering, Dept. of Electrical Engin, *P.O. Box 3435, University Station, Laramie, Wyoming* 82070 (EX-76-S-01-2414)

This investigation consists of six tasks: (1) Generate needed induction responses for a variety of buried conductor shapes. Modify previously developed computer programs to include the buried effect and to produce families of responses for each model in a number of sizes (varied length/radius ratios). Run salinity and conductivity tests on core and water samples provided by LERC and taken from coal burn sites to be investigated in Task II. (2) Make field measurements at the Hanna, Wyoming, coal gasification site to completely characterize coal burn sites No. 1 and No. 2, and at least one other site. (3) Develop a Bayes estimator for the radius of each of the models employing the model responses obtained in Task I. Apply the estimating algorithms to the measured field responses obtained in Task II. (4) In cooperation with Ohio State University, modify the computer programs to take into account the effect of the ground-air interface and the greater complexity of some of the buried conducting structures. Use the computer to study tentative effects on sensitivity of the technique to such factors as depth, conducting contrasts, and electromagnetic wave frequency. (5) Based on the preceding, conduct additional field measurements on coal burn site No. 3 and other new sites available at Hanna. Confirm the effects on measurement sensitivity predicted by the computer study on depth, conductivity contrasts, and electromagnetic wave frequency or modify as needed. (6) Modify the estimation algorithms to fit the refined model data. (FE-TIMS).

SUPPORTED BY U.S. Dept. of Energy, Div. of Coal Conversion & Utilization

5.0042, METHODS FOR DETECTING ROAD SECTIONS WITH HIGH FREQUENCY OF ICE FORMATION

S. Lindgvist, Goteborgs Universitet, Physical Geography, *411 Vasaparken, Fack S-400 10, Goteborg, Sweden* (172244 (HRB NO.))

This project consists of two main investigations. The aim of both these investigations is to work out appropriate methods for detecting sections with high frequency of ice formation. One study is carried out as a local climatological investigation of air temperature, air humidity and road surface temperature. Measuring trips by cars and stationary instruments are used for data collection. To make a visual combination of results possible a simple local climatological map was constructed. The other investigation concentrates on surveying road surface temperature by means of airborne infrared thermography. The thermal scanner is equipped with a detector for the 8-13 microm region, in the thermal pictures differences in road surface temperature are clearly visible. /IRRD/IRF/

SUPPORTED BY Statens Vagverk

5.0043, VISIBILITY WITHIN AND ELECTROMAGNETIC TRANSMISSION THROUGH NATURAL CLOUDS AND FOGS

J. Latham, University of Manchester, *Oxford Rd., Manchester, England, United Kingdom* (DF580090; AF-AFOSR-3511-78)

AF function - target acquisition and tracking reconnaissance. Deficiency - the performance of optical systems looking through the atmosphere is significantly degraded by absorption and scattering by fog and cloud particles. Research - field measurements of spatial and temporal variations of visibility, liquid water content, droplet size distribution and 10.6 micrometer laser transmission in natural clouds and fogs at Great Dunn Fells in Cumbia, England. How research contributes - results will be applicable to the solution of such problems as atmospheric contrast reduction, sky background radiance, out-of-beam scattering and propagation breakdown of laser radiation. Models of atmospheric transmittance will become more specific for different types of environments.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, SURFACE ATTACK TRAINING RESEARCH - STUDY I

T.H. Gray, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223900)

To develop transition training and surface attack training syllabi for A-10 'B' course students in CCT, and (2) to determine simulator features/capabilities required for effective training in the air-to-surface mission. Under these two objectives (transition and surface attack training syllabi development) there are four sub-objectives- (1) syllabus development, (2) generation of objective performance measurement algorithms, (3) human factors evaluation of instructor/operator console design, and (4) assessment of utilization of ASPT training features for surface attack training.

The technical approach taken for satisfying sub-objective 1 follows previous AFHRL/FT syllabus development activities (i.e., the UTP IFS syllabus) which were based on ISD principles. Essentially, a 'cut and try' method will be used that undergoes constant evaluation and modification to discover and solve training problem areas. Sub-objective 2 is a continuation of work in the performance measurement area. Sub-objectives 3 and 4 will be accomplished using questionnaires, AF standards, and observations of subject matter experts. In a classical sense, sub-objective 1 has no independent variables per se. Four TAC instructor pilots (IPs) will use ASPT to train two classes, each consisting of six 'B' course students, on transition and surface attack maneuvers. The progress of these students will be carefully monitored by the IPs and automated performance measures (maneuvers and weapons delivery scores). Sub-objective 2 will follow the performance measurement methodology previously established, wherein time-within-tolerance scores (derived from measured system parameters) are correlated with ratings assigned by subject master experts (the IPs). For sub-objectives 3 and 4, the IPs will be interviewed via standardized questionnaires to determine desired instructor/operator console design features and the value of advanced training features.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0002, AUTOMATED INSTRUMENT CHECKRIDE

E. Martin, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223730)

The objective is to develop a totally automated simulator mission in the ASPT which is representative of an in-flight T-37 instrument checkride and to validate the measurement of pilot performance on this checkride in an operational environment. The primary criterion is predictive validity.

The project will consist of two phases: development and validation. The development phase will include analysis of the T-37 instrument checkride, selection of tasks, development of measurements for the selected tasks, and combination into a complete mission scenario. This mission scenario will be pre-programmed on the ASPT. The validation process will be accomplished in two separate data collection efforts. The first phase of data collection will involve obtaining measurement on T-37 student pilots as soon as possible following their instrument checkrides in the aircraft. Any modifications to the automated checkride will be made following the initial data collection. Final validation will consist of giving the automated checkride to students preceeding the aircraft checkride. The ASPT scores will be used to predict their aircraft scores.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0003, AIRBORNE PERFORMANCE MEASUREMENT CONCEPTS

D. Vreuls, Canyon Research Group Inc., *32107 Lindero Canyon Rd., Suite 123, Thousands Oaks, California* 91361 (DN794041; N61339-77-C-0140)

So that optimal mixtures of flight time and simulator time may be determined for training, a compatible simulator/airborne automated performance measurement system is required. Such a system will permit determination of extent of transfer of training as a function of level of simulator performance. The developed system may also be used for informative student performance feedback. In both cases, low-cost implementation schemes are mandatory.

A methodology for performance measurement in a simulator has been developed and validated. Techniques for implementation will be traded off against constraints in adapting the methodology to airborne measurement. Techniques will include on-board processing while constraints considered will include operational and statutory limitations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Human Factors Lab.

6.0004, AUTOMATED ADAPTIVE LANDING SIGNAL OFFICER EXPERIMENTAL SYSTEM

M. McCauley, Logicon Inc., *P.O. Box 10179, San Diego, California* 92110 (DN894010; N61339-77-C-0109)

In support of development of a trainer for landing signal officers (LSO), a study is required to determine the applicability of advanced training technologies to LSO training.

An analysis will map computer speech understanding, automated adaptive training, and computer graphics techniques into LSO training requirements. A system for laboratory concept demonstration and refinement will be defined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Training Equipment Center

6.0005, FAMILY HEALTH - THE DYNAMICS OF ADJUSTMENT TO SEPARATION

J.A. Plag, U.S. Dept. of Defense, Navy, Naval Health Research Center, Center for P O W Studies, *San Diego, California* 92152 (DN677179)

Family separation, resulting from extended periods of sea duty, is a prevalent social condition of life for naval service personnel and their dependents. Yet the stresses and adaptation ensuing from such conditions are not well defined, especially in terms of their effects on the physical and mental health of either the serviceman or his family. The objective of this work unit is to determine the psychological and sociological factors involved in family separation adjustments in relation to the health and behavior of the serviceman and his family.

Retrospective and prospective analyses of family interactions, attitudes, and health patterns will be conducted from data on three samples of Navy families: (a) those of returned prisoners of war whose condition of separation was unusually long in time and stressful in nature, (b) those of naval aviators and enlisted aviation support personnel during routine deployment, and (c) a matched sample of aviator and support personnel assigned shore duty with family intact for a period comparable to that of the deployed group. Pre-deployment, deployment, and post-deployment periods of time will be sampled for study with interview, questionnaire, service history, and health records employed as sources of data.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Health Research Center

6.0006, DESCRIPTIVE TOXICOLOGY OF JP-5 FUEL DERIVED FROM OIL SHALE

L.J. Jenkins, U.S. Dept. of Defense, Navy, Naval Medical Research Inst., Toxicology Div., *Bethesda, Maryland* 20014 (DN777315)

Substances produced by the extraction of petroleum products from shale may cause serious disease. One of the major health hazards associated with shale oil recovery technology is in

the exposure incurred from the use of these shale products. Since the U.S. Navy is a predictable user of large quantities of JP-5 aviation fuel obtained from shale, this work unit proposes to determine in suitable animal models the acute and chronic toxicology of these fuels.

Determine in suitable animal models the oral, ocular, and dermal toxicity, and both the acute and chronic (120 day) inhalation toxicity of JP-5 aviation fuel. By biochemical and histopathological analysis of tissues from one-half of the animals exposed to JP-5, determine the target organs(s) of JP-5 and the mechanisms which are responsible for the expression of JP-5 toxicity. Retain the other half of the animals surviving the chronic exposure for lifetime observation to determine if JP-5 causes long-term irreversible effects (significantly decreased life expectancy or carcinogenicity).

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Medical Research Inst.

6.0007, A FOUNDATION FOR SYSTEMS ANTHROPOMETRY

H.M. Reynolds, Michigan State University, Graduate School, *13 Natural Resources Bldg., East Lansing, Michigan* 48824 (DF050530; F49620-78-C-0012)

AF function - in day-to-day operations, aircrew members are exposed to a number of dynamic situations such as being subjected to maneuvering forces (g), buffeting, and vibration. A new anthropometry which takes into account such dynamics in the design and operation of crew stations is required. Deficiency - conventional anthropometry provides static dimensions measured on subjects rigidly posed in highly standardized positions, and does not meet requirements for describing body motions in dynamic situations. Objective - a three-dimensional systems anthropometry will be developed which treats the body as a dynamic system. The model will optimize the number of links needed for description of body movement and mobility for workspace design and acceleration/deceleration/simulations. How research contributes - the lack of such an anthropometric system is a significant roadblock to providing criteria central to the design of sophisticated human analogs, both physical and mathematical. This basic human engineering research program will lay the required foundation for using new anthropometric systems which are in sight in the near future.

A means of spatially identifying anatomical and anthropometric landmarks suitable for three-dimensional coordinate description will be developed. Procedures are being developed specifically to define external morphology, internal skeletal geometry and coordinate systems, and also provide a means of relating the new anthropomechanic data to the extant classical anthropometric data. Phase II will provide the methodology necessary to describe the human anthropomechanic system for one body region--the lumbar/pelvic/femur linkage system. Joint centers of mobility in the thoracic/lumbar linkage system will be studied during Phase III in preparation for the major task of relating the shoulder to the hip during Phase IV. In addition, differences in body size and differences within the same individual will be investigated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0008, IMPACT OF LEARNING STYLE CHARACTERISTICS ON TRAINING PERFORMANCE

T. Ragan, University of Oklahoma, Norman Campus, School of Education, Dept. of Education, *Norman, Oklahoma* (DF223120; F33615-77-C-0047)

To identify dimensions of learning style which are relevant to training task performance, to provide methods for assessing learning style characteristics of Air Force trainees, and to recommend instructional methods for bridging gaps between learning styles and training task requirements.

Phase I (12 months) will include accomplishment of the following tasks: literature on the relationships between learning style variables and training performance will be reviewed, learning style variables relevant to design of instruction will be identified, existing instruments for assessing selected learning styles will be evaluated, refined instruments will be developed as necessary, and training tasks which interact with learning style will be identified. Phase II (24 months) will include: identification of training problems attributable to learning styles, studies to identify learning style characteristics common to trainees having difficulty with specific Air Force training tasks, and generation of recommendations for instructional approaches to deal with those learning style-task discrepancy problems identified earlier in the research.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0009, DECOMPRESSION HAZARDS IN AEROSPACE OPERATIONS

J.D. Adams, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF320050)

The objective of this effort is to develop more precise denitrogenation schedules for the prevention of altitude decompression sickness during present and projected altitude flights of common interest to the USAF and NASA. Past and current efforts in defining decompression hazards and establishing denitrogenation requirements have used empirical testing of human subjects in altitude simulations following various oxygen prebreathing schedules. It is now considered feasible to evaluate denitrogenation effectiveness and develop prebreathing criteria by measuring the nitrogen wash-out from the body using precise breath analysis. This effort will be directed toward the development of non-invasive techniques to continuously monitor the state of denitrogenation of personnel exposed to potential decompression hazards. Having such a capability will complement empirical data such that more exact oxygen prebreathing times can be developed and applied to a wide variety of aerospace decompression problem areas.

A non-invasive technique for monitoring and evaluating the state of denitrogenation under various aerospace operational profiles will be developed. The basis of the technique is to continuously measure the quantity and rate of nitrogen 'washed out' from the body while breathing 100 percent oxygen by mask. The partial pressure of nitrogen and other respiratory parameters will be measured on a breath-by-breath basis with a mass spectrometer. With this and other respiratory data, the total nitrogen eliminated or taken up can be followed, thus providing a more precise evaluation of denitrogenation effectiveness as it actually takes place during different mission profiles and procedures.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0010, CLINICAL EVALUATION OF G-SENSITIVE MEDICAL CONDITIONS IN AIRCREW

K.K. Gillingham, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF323590)

To assess the g tolerance of aircrew members with various medical conditions for the purpose of evaluating their ability to perform safely and effectively in flight; to establish g tolerance norms for clinical aeromedical use; and to determine the effects of medications and other therapies on g tolerance.

Aircrew member patients referred to the USAFSAM Aeromedical Consultation Service for evaluation of waiverable medical conditions (e.g., heart valve lesions, heart rhythm disturbances, treated hypertension, loss of consciousness in flight) will be subjected to various degrees of g stress on the USAFSAM human centrifuge to determine whether their particular medical conditions lower their g tolerance significantly. Age-stratified groups of healthy pilots on flying status will be subjected to identical tests of g tolerance, and tolerance data will be statistically analyzed to provide more precise descriptions of normal g tolerance of aircrew than are presently available. Patients treated with various medications (e.g., aldactazide for hypertension) and/or other forms of therapy will be subjected to g stress on the human centrifuge, and their tolerance data will be compared statistically with normative data to determine whether such treatments have deleterious effects on g tolerance. A portion of the proposed work has been accomplished under work unit 79301310, which has been discontinued.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, PROBLEMS IN OPTIMAL REPEATED MEASUREMENTS DESIGNS, ROBUST OPTIMAL DESIGNS, SURVEY DESIGNS AND DESIGNS WITH VARIABLE SUPPORT SIZES

A. Hedayat, University of Illinois, Chicago Circle Campus, School of Liberal Arts & Sciences, Dept. of Mathematics, *601 S. Morgan St., Chicago, Illinois* 60680 (DF044090; AF-AFOSR-3050-76)

AF function - improve the methods of data collection. Deficiency -there is a strong need in the Air Force to reduce costs and save time in the collection of large amounts of data, such as communication, equipment testing, and aerospace medicine data. Objective - the reduction in costs and time should be done clearly without any damage to the statistical quality of the data being collected. How work contributes - improve the methods used in investigation using experimental units that are scarce and/or costly and thus have to be used in several experiments, or in investigations where the experimenter might be interested in discovering whether or not a trend can be traced among the responses obtained by successive applications of several treatments on a single experimental unit. Improve the methods of analysis for data collected in hostile environment which often results in incomplete and/or questionable data. Methods to be developed can help in the study of relationships between biomedical measurements within and between individuals to provide improved input to such decisions as flight clearance.

Research will be conducted leading to new statistical design of experiments which can help the researcher from the beginning to the final stage of his experiment. The main problem areas to be studied are (1) characterization and construction of optimal repeated measurements designs - (2) generalized youden designs of practical sizes - (3) theory and application of bib designs with repeated blocks - (4) robust optimal designs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0002, MGT TOOLS CASE STUDY

R. Black, Boeing Computer Services Inc., *P.O. Box 24346, Seattle, Washington* 98124 (DF729260; F30602-78-C-0044)

The objective is to examine in depth a large ongoing development program with advanced management tools and procedures carefully selected to complement advanced software production technology.

The approach of this effort is to examine the NASA IPAD (Integrated Program for Aerospace Vehicle Design) documentation and to assess its potential for use in validating management models to be developed in the subsequent year. The IPAD program under contract to BCS is the only known program appropriately instrumented to yield data which appears useful to validate several planning and assessment models. The ultimate end item is checklists and SOPs for planning, reviewing, and acting on software development products.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, MODERN SPECTROSCOPY AND COLLISION STUDIES OF FUNDAMENTAL ATOMIC AND MOLECULAR SYSTEMS

W.H. Wing, University of Arizona, School of Liberal Arts, Dept. of Physics, *Tucson, Arizona* 85721 (PHY77-15217 A02)

Research is proposed on three problems in modern spectroscopy of fundamental atomic and molecular systems. In the first project, a recently developed ion-beam infrared-laser resonance apparatus will be used to perform extremely high-resolution spectroscopy and collision measurements on the hydrogen molecular ion. In the second project, precise microwave-optical spectroscopic and collision studies will be made on highly excited helium atoms. Both these systems represent three-body problems fundamental to the understanding of atomic and molecular structure. In both cases the precision achievable is several orders of magnitude greater than is achievable by conventional optical spectroscopy.

The first project has the additional potential to improve knowledge of fundamental contrasts, especially mass ratios, and also will be extended to include other ions important in astrophysics, quantum chemistry, and high-temperature gaseous and plasma processes.

In the third problem theoretically predicted and recently observed velocity-dependent sharp features in the helium-neon excitation transfer process responsible for laser action, and the velocity dependence of metastable and Rydberg helium-normal helium collisions, will be studied by a computerized time-of-flight method.

This work is a continuation of that currently supported under NSF grant number PHY75-03549A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0002, RESONANT PROCESSES IN ELECTRON SCATTERING

S. Wong, Yale University, School of Engineering, Dept. of Engineering & Applied Science, *206 Elm, New Haven, Connecticut* 06520 (PHY78-00526)

Research will continue on the role of resonances in electron scattering from atoms and simple molecules, and the development of new instrumentation. Further work will be done studying electron impact on excited species (such as N2* and CO*), and various resonances in electron impact on atoms and molecules in the ground state. A new experiment will be started, to study resonances in collisions of electrons with negative ions.

This research is a continuation of that currently supported under NSF Grant PHY76-00235 AO2.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0003, QUANTUM THEORY OF MOLECULES AND SOLIDS

J.R. Sabin, State University System of Florida, University of Florida, School of Arts & Sciences, Dept. of Physics & Chemistry, *208 Tigert Hall, Gainesville, Florida* 32601 (DMR76-84577 A01)

Theoretical investigations of the electronic structure and properties of condensed matter previously supported by DMR-7101175 will be continued. Local density models for many-electron systems will be explored and exploited in these studies.

This program involves development of efficient computing techniques which avoid, at least partly, the 'muffin-tin' approximation and will provide the basis for: a) computation of quantities of experimental interest that are not directly expressible in terms of electronic energies; b) investigation of the practicality of recent developed mathematical schemes (generator coordinate method) for obtaining improved many-electron wavefunctions. Work begun under the previous grant to treat the interaction of molecules with metallic surfaces (fundamentals of catalysis) will continue. Adsorption of hydrogen, oxygen, carbon and sulfur on nickel surfaces is currently under study, with emphasis on appropriate treatment of spin-polarization and non-muffin-tin effects. Improved calculations of crystalline defect properties and of the details of photoemission spectra from Xo and similar models will be done.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0004, IMPURITIES IN SUPERCONDUCTORS
D.M. Ginsberg, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *2527 Hydrosystems Lab., Urbana, Illinois* 61801 (EY-76-C-02-1198)

Electron tunneling measurements are being made on superconducting samples with dissolved hydrogen. We are looking for local vibrational modes introduced by the hydrogen, and we also want to determine whether the hydrogen increases the electron-phonon coupling, thereby enhancing the superconductivity. These types of information can be deduced directly from the tunneling data.

We are also making specific heat measurements on superconducting films with magnetic impurities from among the 3-d chemical elements. The results are being compared with a theory which goes beyond the Born approximation, and is, in fact, carried out to all orders of the exchange constant. The results will indicate whether the quantum-mechanical nature of the impurity spin must be explicitly taken into account to correctly describe the results.

SUPPORTED BY U.S. Dept. of Energy, Unspecified Unit

8.0005, NUCLEAR MAGNETIC RESONANCE IN SOLIDS
C.P. Slichter, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *2527 Hydrosystems Lab., Urbana, Illinois* 61801 (EY-76-C-02-1198)

The interests of this group are in fundamentals of solid-state physics including many-body problems, phase transitions, magnetism, and solids which possess exotic properties. Most of the present work involves use of nuclear magnetic resonance to probe magnetic and electric fields in solids. As an example, we have recently studied what happens to the magnetism of an atom which is normally magnetic (e.g., Cr, Mn, Fe) when imbedded in a non-magnetic metal (Cu). By observing the nuclear resonance of Cu atoms which are near neighbors to the 'magnetic' atom, we can deduce the conduction electron spin magnetization density at known positions induced by the magnetic atom. Analysis of the spatial form of the map and the way it changes with temperature answer important questions in magnetism.

We are also currently studying charge density waves and aspects of catalysis. We make extensive use of special methods such as observing the resonance of one species of nucleus while exciting a second resonance, to enable us to see resonance otherwise too weak to observe.

SUPPORTED BY U.S. Dept. of Energy, Unspecified Unit

8.0006, SPECIFIC HEAT AND ELECTRICAL PROPERTIES OF THE VANADIUM-TITANIUM MIXED OXIDES AT LOW TEMPERATURES
P.H. Keesom, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (DMR76-80551)

Structural, thermodynamic, and electrical transport properties (including resistivity, thermoelectric power, heat capacity, magnetic susceptibility, and tunneling) of the single crystal alloys (TixV1-x)2O3 are being studied between 300 K and nearly 0 K. For 0 x 0.055 these crystals undergo a semiconductor to metal transition in the temperature range from 170 K to 0 K. It is expected that this study will contribute to the understanding of this transition.

When x equals 0.055 these transition metal oxides are metallic. They and their mirror image (VxTi1-x)2O3 show properties very similar to that of the noble metal spin glasses e.g.: AuFe or CuMn. All these systems show a very large term, linear in temperature, in the specific heat. The metallic (TixV1-x)2O3 exhibits a minimum in the resistivity while (VxTi1-x)2O3 exhibits a cusp in the susceptibility; both phenomena are found also in the noble metal spin glasses. The cusp in the susceptibility and the absence of any anomaly in the specific heat of the noble metal spin glasses is not understood; it should therefore be of help to investigate crystalline systems which show similar behavior. The investigation of the metallic transition metal oxides is also of intrinsic value as it will provide information on their semiconductor to metal transition and on their higher temperature properties. Of particular interest is the manner in which the temperature and heats of the semiconductor-metal transition in (TixV1-x)2O3 approach zero as x passes the critical value of x equals 0.0555.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0007, SPECTRUM, ENERGY LEVELS, AND ANALYSIS OF SINGLY IONIZED CESIUM (CS II)
C.J. Sansonetti, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (PRF 08706)

This research is an attempt to revise and extend the term analysis of the Cs II ion. We have completed extensive self-consistent field calculations of the structure and spectrum of Cs II which suggest a need for major revision of the 1942 analysis of Wheatley and Sawyer. A critical appraisal of their transition array in light of our calculations indicates that less than half of the reported levels are well supported; and, in particular, that several of the lowest-lying odd levels have been incorrectly determined. Consequently, we have undertaken a remeasurement of the spectrum to resolve these problems. Using the 3m vacuum spectrograph at Argone National Laboratory, the 9m Paschen-Runge spectrographs at Purdue and Argonne, and high resolution Fourier spectrometers at Laboratoire Aime Cotton and at Kitt Peak National Observatory we expect to produce a comprehensive Cs II line list for the 1500 A-4.0 micron region. Work with all of these instruments is currently in progress. Although we have not yet begun a systematic application of this term analysis, we have located six new levels in good agreement with our calculations, four of which replace incorrect levels of Wheatley and Sawyer.

We also anticipate significant results in areas beyond the original scope of this work. These include analysis of the prominent hyperfine structure of Cs II, measurement of the Cs I spectrum to 4 micron, an improved ionization limit for Cs I, and a study of penetration effects in the f and g levels of Cs I.

SUPPORTED BY Purdue Research Foundation

8.0008, NUCLEUS-NUCLEUS INTERACTIONS AT HIGH ENERGIES
W.V. Jones, Louisiana State University, Agricultural & Mechanical College, Graduate School, *University Station, Baton Rouge, Louisiana* 70803 (PHY77-01083)

A study of heavy nuclei interacting in nuclear emulsion is in progress. Data already exist in emulsions which were exposed to cosmic radiation in a balloon flight at a latitude corresponding to a geomagnetic cut-off of 1.5 GeV/nucleon. A second exposure to a beam of iron nuclei, 2.1 GeV/nucleon, is planned. The combination of the two exposures will enable measurements of nucleus-nucleus interaction events over a continuous range of energies up to 80 GeV/nucleon.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0009, NUCLEAR MAGNETIC RESONANCE STUDIES OF CRITICAL PHENOMENA IN ANTIFERROMAGNETIC INSULATORS WITH RANDOM DISORDER
A.M. Gottlieb, Clark University, Graduate School, Dept. of Physics, *950 Main St., Worcester, Massachusetts* 01610 (DMR77-11307)

Recently there has been intensive theoretical interest in the effects of quenched disorder on critical exponents and several predictions have been made which have not been experimentally tested. The effects of quenched disorder on magnetic systems will be investigated by zero-field nuclear magnetic resonance experiments to determine the critical exponent. Because of the very precise data available on non-disordered MnF2, this d equals 3 Ising antiferromagnet is the first candidate for study. Disorder will be introduced by replacing some of the magnetic Mn atoms with non-magnetic Zn or Mg. Studies of the d equals 3 Heisenberg antiferromagnet RbMnF3 with substituted Mg impurities are also planned. Like MnF2, this system is well understood for the non-

disordered case. The cases of MnF2 and RbMnF3 are particularly significant not only because they are 'classic' cases in the field of critical phenomena, but also because they span a series of specific theoretical predictions on the effects of disorder.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0010, HYPERFINE INTERACTION STUDIES IN MAGNETICALLY ORDERED SOLIDS, WITH APPLICATION TO CRITICAL PHENOMENA AND LATTICE DEFECTS

C. Hohenemser, Clark University, Graduate School, Dept. of Physics, *950 Main St., Worcester, Massachusetts* 01610 (DMR77-01250 A01)

A series of experiments will be done to study the effect of disorder on critical exponents. Disorder will be introduced into ferromagnets both through nonmagnetic impurity atoms and through lattice defects. Other projects include further work on critical fluctuations, studies of Mossbauer energy shift oscillations near Tc; and a crucial test of the probe independence hypothesis. In addition, a comprehensive review of critical point studies with hyperfine field techniques including perturbed angular correlations (PAC), Mossbauer effect, and nuclear magnetic resonance will be undertaken. Samples with defects will be prepared by charged particle bombardment and quenching of Mossbauer and PAC sources. The defects will be detected by trapping on hyperfine probe nuclei through suitable annealing sequences. In following this approach, it is hoped to obtain information about structure and migration complementary to that using non-implantation and ion-beam methods.

This is a continuation of work begun under NSF Grant No. DMR75-02982; this is the first year of a 3-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0011, SCATTERING SPECTROSCOPY OF LIQUID CRYSTALS

D.J. Litster, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DMR76-18035 A01)

Studies of the normal modes and phase changes in liquid crystals are underway. Experimental techniques include: (1) investigation of the spectrum, polarization, and intensity of light scattered by thermal fluctuations about the equilibrium state, and (2) investigation in the time domain of system response to pulses from a mode-locked dye laser, and (3) high-resolution X-ray scattering to examine the liquid crystal structure factor S(q). The initial effort is on smectic A phases, with later extension to smectic phases C, B, D etc. These experiments are expected to be significant for the intellectual development of condensed-matter physics with respect to examination of the scaling hypothesis, elucidation of phase changes, and testing of certain aspects of many-body theory.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0012, FUNDAMENTAL INVESTIGATIONS USING POSITRONS AND POSITRONIUM

A. Rich, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Physics, *Ann Arbor, Michigan* 48104 (PHY77-28139)

Recent studies of the decay rate of ortho-positronium have shown a serious discrepancy with calculations based on current atomic theory. Further studies will be made of this decay rate in various environments (powder, gas, and vacuum). In addition, research will be initiated on the decay rate of para-positronium, on the allowed four-photon decay of positronium, and on the polarization of slow positron beams.

This is a continuation of work supported by NSF Grant PHY76-02398 A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0013, THEORIES OF QUARKS AND LEPTONS

T. Cheng, University of Missouri, St. Louis Campus, School of Arts & Sciences, Dept. of Physics, *8001 Natural Bridge Rd., St. Louis, Missouri* 63121 (PHY78-08427)

The proposed work is in the area of theoretical physics, and suggests study of various problems in elementary particle interactions. It is becoming increasingly plausible that modern gauge theories provide the correct theoretical framework in which to describe such elementary particle reactions. The present work will study the possibility of a natural link between dynamics and various approximate symmetries observed in nature using some particular features of the fermion mass matrices-Majorana mass terms which violate lepton number conservation; non-diagonal terms which bring about fermion- and lepton- mixing, etc. The possibilities of massive neutrinos and massless u- quarks will also be examined.

This is a continuation of research currently supported under NSF grant PHY76-09798 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0014, THEORETICAL STUDIES OF SPIN CORRELATION FUNCTIONS

P.A. Fedders, Washington University, School of Arts & Sciences, Dept. of Physics, *4559 Scott Ave., St. Louis, Missouri* 63130 (DMR77-06719)

A theoretical program of four partially overlapping categories will be carried out: 1. The study of time-dependent spin correlation functions for systems of strongly interacting spins in the high temperature limit. These studies are based on first principles microscopic equations of motion and should elucidate our understanding of dynamical interactions in spin systems. 2. The development and application of a recently discovered formalism for treating the hopping of vacancies, impurities, and interstitial hydrogen in crystal lattices. This formalism is applicable to correlation functions measured in neutron scattering and magnetic resonance experiments in systems where the hopping rates between members of a pair of sites are asymmetric. 3. The further study of the effects of impurities and other crystal defects on measurable spin correlation functions. The proposed work in this category attacks the important problem of how one can quantitatively study crystal defects. 4. The study of basic spin-phonon interactions and their effects on spin lineshapes and on acoustic velocity and attentuation.

This is a continuation of research supported under DMR7518100.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0015, MAGNETIC RESONANCE AND OTHER STUDIES AT LOW TEMPERATURES

R.E. Norberg, Washington University, School of Arts & Sciences, Dept. of Physics, *4559 Scott Ave., St. Louis, Missouri* 63130 (DMR78-10780)

This is a continuation of work sponsored under DMR-7618863. The diffusion and relaxation of dilute impurities of hydrogen and helium in simple solids and liquids will be measured. The Kapitza problem of energy transfer across a solid-liquid helium-II interface will be studied by means of measurements of phonon transmission and reflection. Metal hydrides will be studied by a method of hydrogen nuclear acoustic resonance. Defect controlled spin relaxation and ultra slow diffusion in solid krypton and krypton rare gas mixtures will be studied. Collective excitations in amorphous solids will be studied by magnetic specific heat at temperatures down to 100 mK. This work is important for understanding the nature of helium-II excitations at low temperature and the nature of diffusion in simple solids and liquids.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0016, SPECTROSCOPY OF ALKALI ATOMS TRAPPED IN RARE-GAS MATRICES

L.C. Balling, University System of New Hampshire, School of Liberal Arts, Dept. of Physics, *Durham, New Hampshire* 03824 (PHY78-05369)

This investigation in atomic physics will study the interaction between specific types of atoms as the distance between them (which can be controlled) is held constant. The energy-level structure of alkali atoms trapped in various sites in rare-gas matrices at liquid-helium temperatures will be determined. Pulsed one- and two-step dye laser excitation will be used to locate the excited states; the lifetimes of these states and the wavelength distribution of the luminescence will be observed. Comparisons of the experimental results with theoretical calculations, carried on concurrently, will be made to determine the nature of the trapping sites. The effect of the rare-gas matrix on the energy-level structure of the alkali atoms will be calculated, using the same techniques employed to compute alkali-rare-gas diatomic potentials.

This is a continuation of work supported by NSF Grant PHY74-05548 A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0017, QUANTUM FIELD THEORY WITH DENSITY, TEMPERATURE, AND MAGNETIC FIELD CONSTRAINTS

B.J. Harrington, University System of New Hampshire, School of Liberal Arts, Dept. of Physics, *Durham, New Hampshire* 03824 (PHY77-11521)

Research into several aspects of quantum field theory in a physical medium will be carried out. Questions concerned with the behavior of matter under extreme astrophysical conditions of high density, temperature, and external magnetic field are used to motivate studies in two principal areas: the electromagnetic structure of cold dense matter and collective effects in non-Abelian gauge theories.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0018, VORTICITY AND THERMO-ROTATION IN SUPERFLUID HELIUM

W.I. Glaberson, Rutgers the State University of New Jersey, New Brunswick Campus, School of Arts & Sciences, Dept. of Physics, *Old Queens Bldg., New Brunswick, New Jersey* 08903 (DMR76-82339 A01)

This work is a continuation of work begun under NSF Grant No. DMR73-07515 and an extension to new experiments. Superfluid and normal properties of Helium-3, Helium-4 and mixtures of Helium-3 and Helium-4 will be studied using a number of different techniques. In one series of measurements vortex pinning forces and superfluid turbulence will be studied using thermo-rotation measurements in Helium-4. In another series of measurements the interaction of a vortex with charged ions will be studied by measuring the capture cross section of vortices for ions and by measuring both the thermal and non-thermal escape of ions from vortices. As time and resources permit, an effort will be made to study the thermal boundary resistance between liquid helium and cerium-magnesium nitrate.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0019, THEORY OF DISORDERED SOLID-STATE SYSTEMS

J.M. Luttinger, Columbia University, School of Arts & Sciences, Dept. of Physics, *Broadway & W. 116th St., New York, New York* 10027 (DMR77-06716 A01)

Theoretical studies of disordered solid-state systems previously supported by DMR-7509939 will be continued. A combination of various mathematical methods will be used including path integrals, variational techniques and exactly soluble models. The emphasis of the previous research has been on equilibrium properties such as heat capacity, diamagnetism and phase transitions. The methods will be developed further to include non-equilibrium properties such as electrical conductivity. The latter is of especial interest because of its connection to the 'Mott' problem; that is, the transition from localized to non-localized states. Another direction of this research will include the study of collective excitations of disordered systems, particularly in relation to the well-known low-temperature specific heat anomaly in spin-glasses.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0020, SPIN RESONANCE AND THE STUDY OF SOLIDS AND LIQUIDS

R.M. Cotts, Cornell University, Ithaca Campus, School of Physical Sciences, Dept. of Physics, *Ithaca, New York* 14850 (DMR77-24561)

This is a continuation of research previously supported under DMR 73-07521.

A series of experiments which will utilize nuclear magnetic resonance to investigate the details of diffusive motion of hydrogen atoms in transition metal-hydrogen systems will be carried out. The results of two separate experiments (temperature dependence of relaxation times and pulsed gradient spin echo techniques) will be combined to determine the diffusion step length of hydrogen atoms in titanium hydride. A new multiple pulse technique for measuring the hydrogen diffusion coefficient will be applied to vanadium and tantalum hydrides. The motion of hydrogen in the low temperature phases of Group VB metals will also be studied using measurements of the relaxation times. The purpose of the low temperature experiment is to determine changes in mobility with change in phase and to search for low temperature deviation which would indicate tunneling modes for hydrogen.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0021, GENERAL RELATIVITY

P.G. Bergmann, Syracuse University, School of Arts & Sciences, Dept. of Physics, *Hall of Languages, Syracuse, New York* 13210 (PHY78-06721)

Research in gravitational theory initiated under NSF Grant PHY74-15246A03 will be continued. Among the topics to be investigated are: 1. Positive energy conjecture and the cosmic censor hypothesis; 2. Theories with torsion and other theories with gauge groups; 3. Supersymmetry and supergravity; 4. Twistors, H space, and gauge fields; 5. Equations of motion; 6. The Hawking process.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0022, MAGNETIC AND ELECTRICAL STUDIES IN N-TYPE SEMICONDUCTORS

T.G. Castner, University of Rochester, School of Arts & Sciences, Dept. of Physics & Astronomy, *260 Crittenden Blvd., Rochester, New York* 14627 (DMR77-20450)

Experimental studies of the dielectric behavior, frequency-dependent conductivity, and magnetic behavior of heavily doped N-type semiconductors doped near the critical concentration for the onset of metallic behavior, which were previously supported by NSF grant DMR-7612586 will be continued. These studies should give new information concentration for the onset of metallic behavior, which were previously supported by NSF grant DMR-7612586 will be continued. These studies should give new information concentrating (1) the origin of the unsatisfactorily explained negative magnetoresistance of heavily doped semiconductors, (2) the components of the single valley donor polarizability tensor, (3) the frequency dependence of the conductivity into the microwave region in the liquid-helium temperature range, and (4) the very low-temperature spin ordering and exchange interactions as a function of donor concentration. Capacitance measurements, magnetocapacitance measurements, piezocapacitance measurements using uniaxial stress, low frequency and microwave conductivity measurements, and mag-

netization studies yielding information on magnetic susceptibilities will be made. In addition to measurements in the 4 K to 1.1 K range, certain measurements will be made to 0.01 K in a dilution refrigerator. Magnetic fields up to 115 kilogauss will be employed. These studies will aid in understanding how donor wave functions behave in zero and large magnetic fields at concentrations close to the metallic transition and the nature of the conductivity processes involving these donor electrons.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0023, ATMOSPHERIC HIGH-ENERGY NEUTRONS
G.M. Frye, Case Western Reserve University, Graduate School, Dept. of Physics, *2040 Adelbert Rd., Cleveland, Ohio* 44106 (ATM76-11637 A02)

This grant will support the analysis of data obtained during a balloon flight from Broken Hill, Australia, on April 15, 1977, with the EOSCOR (Extended Observation of Solar and Cosmic Radiation) detector. This experiment was developed by a Case Western Reserve University and Melbourne University collaboration for the long-duration balloon flight system under development by NCAR and therefore meets its constraints on total weight, power, and telemetry. The basic design philosophy of the EOSCOR detector was to combine an effective detecting area of two square meters with reasonable detection efficiency and good time resolution to separate neutrons and gamma-rays.

The balloon flight from Broken Hill reached an altitude of 50 k ft (approximately 100 mbar) when the balloon burst. Recovery of the experiment was carried out with no damage to the scientific package. Since the downward atmospheric neutron flux is near maximum at 100 mbar, further analysis should indicate the sensitivity of the instrument to neutron events in the atmospheric radiation environment. The investigators have already tested the neutron detection efficiency at the CWRU Van de Graaff accelerator. The intention of this grant is to establish background counting rates for the detector so that a better estimate of sensitivity to solar neutrons at the top of the atmosphere can be made.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

8.0024, THEORETICAL STUDIES ON VARIOUS COMPOSITE PARTICLE SYSTEMS
L.L. Foldy, Case Western Reserve University, School of Science, Dept. of Physics, *2165 Adelbert Rd., Cleveland, Ohio* 44106 (PHY78-11629)

The work is in the field of theoretical physics, with emphasis on attempting to understand the interactions of elementary particles with nuclei. Particular projects which will be studied are in the areas of: a) Multiple Scattering Theory: 1) Target particle binding effects; 2) Intrinsic multiple scattering. b)Separable and Non-local Potentials; c) Coulomb Lattices; d) Relativistic Particle Systems; a) Miscellaneous Problems. 1) Gauge variance of observables; 2) Phenomenology of exchange currents in nuclei; 3) Ramsauer Effect; 4) Quantum mechanics on various manifolds; 5) Properties of special classes of random matrices.

This work is a continuation of that currently supported under NSF grant PHY76-00299 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0025, LOW TEMPERATURE TRANSPORT PHENOMENA IN METALS
J.C. Garland, Ohio State University, Columbus Campus, School of Mathematics & Physical Sciences, Dept. of Physics, *164 W. 17th Ave., Columbus, Ohio* 43210 (DMR78-09428)

Experimental studies of thermoelectricity in superconducting metals and of the strong field galvanomagnetic properties of inhomogenous metals previously supported by NSF grant DMR-7611633 will be continued. The low temperature transport studies will be concentrated in two problem areas. The first of these will include measurements of thermoelectricity in pure superconductors by a technique developed earlier in which magnetic flux is generated within a toroidal cavity. This is an extension of previous research which identified a thermoelectric effect unique to the superconducting state. The second problem area is concerned with the effect of inhomogeneities on electron transport in metals under the influence of strong magnetic fields. The experiments will be concentrated on materials consisting of superconducting grains imbedded in a normal metal medium.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0026, MANY-BODY METHODS FOR ATOMS AND MOLECULES
H.P. Kelly, University of Virginia, School of Arts & Sciences, Dept. of Physics, *Garrett Hall, Charlottesville, Virginia* 22903 (PHY77-07154)

Research on many-body calculations of atomic and molecular properties initiated under NSF Grant PHY75-08080 A01 will be continued and extended. Photoionization cross sections including resonance and other correlation effects will be calculated. Particular attention will be given to the important process of double electron photoionization and to photoionization with excitation to bound excited states. Calculations will also be made of photoionization cross sections for molecules.

Auger rates will be calculated including correlation corrections, and particular attention will be given to the recently observed process of three-electron Auger rates in argon.

Relativistic corrections for photoionization cross sections and for bound oscillator strengths will be calculated. The effects of electron correlations on matrix elements involving parity violation due to neutral currents will be investigated.

Other properties which will be investigated are molecular Auger rates, oscillator strengths, and photodissociation rates.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, A HIGH RESOLUTION ECHELLE SPECTROGRAPH FOR ASTRONOMICAL SPECTROSCOPY
B.L. Lutz, Lowell Observatory, *P.O. Box 1269, Flagstaff, Arizona* 86001 (AST77-20606)

Funds will be provided for the construction of a high resolution Cassegrain Echelle Spectrograph for use with the 72 inch Perkins reflector at Lowell Observatory in Flagstaff, Arizona. The design of the instrument will be based on the Mark III version of the Smithsonian Institution's Mount Hopkins Cassegrain Echelle Spectrograph. This design has proven to be highly versatile and efficient for numerous observational projects and is ideally suited for moderate sized telescopes. The instrument will be designed to utilize modern detectors over the entire optical wavelength range and to take advantage of the broad wavelength coverage provided by the two-dimensional array of the Echelle format.

Observations to be made with this instrument include high resolution studies of planetary atmospheres, spectroscopy of interstellar clouds, and abundance studies of the atmospheres of late-type stars.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0002, MARINER-JUPITER-SATURN
L.A. Soderblom, U.S. Dept. of the Interior, Geological Survey, Astrogeologic Studies Branch, *601 E. Cedar Ave., Flagstaff, Arizona* 86001 (8-9580-01031)

Substantial revision to the base line plan for the Voyager missions to Jupiter and Saturn has resulted in a significant increase in the scientific potential of the mission. Aside from the major planets and rings, the satellites, which are now targets for the mission, are the Jovian satellites Io, Europa, Ganymede, Callisto, and

J5 and the Saturnian satellites Titan, Tethys, Rhea, Dione, Mimas, Iapetus, and Hyperion. It is interesting to note that the sum total of the area of all the satellites, which will be studied by photogeologic techniques, is roughly equivalent to the total areas of Mercury, Mars, the Moon and those areas of the Earth above the hydrosphere.

The primary activities for fiscal 1978 include the cruise phase and preparation for encounters with Jupiter and the Galilean satellites early in FY '79. Over 45,000 images will be returned by both spacecrafts in early 1979.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

10.0003, GROUND BASE MEASUREMENT AND HISTORICAL ANALYSIS OF THE SOLAR CONSTANT AND CLIMATOLOGICALLY IMPORTANT ATMOSPHERIC CONSTITUENTS

R.J. Angione, California State University & Colleges, San Diego State University, School of Sciences, Dept. of Astronomy, *5402 College Ave., San Diego, California* 92115 (ATM77-07987)

This grant will support the continuation of a long-term program of analysis of data on variations in atmospheric constituents and the solar spectral energy output during the period 1902 to 1960, combined with modern ground-based observations.

Half of the effort will be devoted to accurate determination of the solar constant and spectral energy distribution using modern techniques of analysis on published results and archival data from the Smithsonian Institution's solar constant observing program. This program was operated for more than 50 years under the direction of Dr. C. G. Abbot, and is unparalleled among photometric programs in terms of accuracy and time length of baseline. Analysis of these data represents a way of recovering accurate, quantitative information on variations in the solar energy output over long-term scales.

The second half of the effort will be devoted to the establishment and operation of a state-of-the-art solar constant observing station at Mt. Laguna Observatory in Southern California. This station will incorporate all of the methods proven useful in over fifty years of Smithsonian observations, as well as modern technical advances to provide highly accurate contemporary benchmark values for variations in atmospheric constituents and the solar constant. Experience gathered in the operation of this station will be used in interpretation of the Smithsonian data. Long-term operation of the station is planned in a manner that will keep the need for long-term support at an absolute minimum.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0004, CLOSED CYCLE REFRIGERATORS FOR THE HAT CREEK INTERFEROMETER

A.C. Cheung, University of California, Berkeley Campus, Graduate School, *2200 University Ave., Berkeley, California* 94720 (AST77-17986)

Two cryogenic enclosures for the radiometers of the millimeter-wave radio interferometer at Hat Creek, California, will be developed. The purpose of these enclosures will be to cool the front end of the radio receivers to the appropriate temperatures of 77 degrees K or 4 degrees K using closed cycle refrigerators integrated with the enclosures.

A factor of two improvement in the capabilities of the interferometer at wavelength of twelve millimeters will result. At a wavelength of two millimeters, a factor of ten improvement in the system temperature can be expected. This improvement will allow for mapping studies of formaldehyde, ammonia and waterline emission regions in the Galaxy.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0005, STUDIES OF PULSAR RADIO SIGNALS AFTER REMOVING INTERSTELLAR DISPERSION

B.J. Rickett, University of California, San Diego Campus, Graduate School, Dept. of Applied Physics & Info Science, *P.O. Box 109, La Jolla, California* 92037 (AST76-03745 A01)

This research program is designed to study the microstructure of pulsars at radio frequencies through use of on-line and off-line dispersion removal. That is, the smearing effect in the pulsar signal caused by the presence of interstellar material must be removed to permit analysis of the data. Data from the stronger pulsar pulses will be analyzed to reveal typical time scales and spectral widths of the microstructure. Further analysis of these microstructure data will concentrate on the radio spectrum, polarization and longitude dependence. This latter study will clarify the relationship between subpulses and micropulses. Development will be done of a practical swept local oscillator technique for on-line dispersion removal. This technique will be applied to study the morphology of microstructure of a much larger sample of (weaker) pulsars. The results will be compared with the 'polar cap' models of pulsar radiation. Results from this work will lead to better models and understanding of pulsar structure and radiation mechanisms.

This is a continuation of work previously supported under NSF grant AST76-03745.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0006, MEASUREMENT OF STELLAR PARALLAXES AND PROPER MOTIONS

A.R. Upgren, Wesleyan University, Graduate School, Dept. of Astronomy, *Middletown, Connecticut* 06457 (AST77-26554)

Continued support is for the observation, measurement and reduction of astrometric plates in order to obtain parallaxes and proper motions of dwarf stars, mostly of spectral classes K and M. Most of the program stars are nearby field dwarf stars taken from the McCormick lists, although a number of similar members of the Hyades cluster and several nearby subdwarfs are now also on the program. One of the continued aims of the program is the study of physical and kinematical characteristics of stars inhabiting the lower main sequence of the Hertzsprung-Russell correlation diagram. Several investigations have already been completed which relate their physical and kinematical properties, and others will be carried out when more parallaxes are determined.

Prior support was by NSF grant AST 74-00758.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0007, TARGET SURVEILLANCE, COMMAND CONTROL AND COMMUNICATIONS, FORECAST, PREDICTION OF SOLAR FLARES

G.E. Brueckner, U.S. Dept. of Defense, Navy, Naval Research Lab., *Washington, District of Columbia* 20375 (DN920046)

A capability is needed to forecast increases in solar short wavelength radiation (solar flares) and in solar particle emission, since these produce ionospheric and geomagnetic disturbances which adversely affect radio communication, over the horizon radar, guidance-control, and detection.

Instrumentation is flown in rockets and satellites to determine the effects of flare activity on the sun's ultraviolet spectrum. Also, time-resolved images of flaring solar regions are recorded in their ultraviolet emission wavelengths to study the flare mechanism and to discover the causes of flares. The solar corona is monitored, to record particle ejections from the sun, and to study the conditions under which these are reliable predictors of particle-induced disturbances at earth. New instruments for data processing and for detection of extreme ultraviolet radiation are developed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

10.0008, MAUNA KEA OBSERVATORY 2.25M TELESCOPE CONTROL SYSTEM

T.B. McCord, University of Hawaii System, Manoa Campus, Graduate School, *Spalding Hall, Room 359, Honolulu, Hawaii* 96822 (AST76-81951 A02)

This grant will provide funds for completion of a new control system for the Mauna Kea Observatory of the University of Hawaii. The 88-inch telescope was designed and built in the

1960's and was delivered to the Institute of Astronomy of the University of Hawaii in 1970. The telescope has been in constant use since installation and is mechanically and optically sound. There have, however, been continuing problems with the telescope's electrical and electronic systems. Observing techniques and technology have advanced considerably since the telescope was designed, and the original design is now obsolete. It is now time to rebuild the telescope's electrical and electronic systems in order to make efficient use of this facility.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0009, RADIO OBSERVATIONS OF INTERSTELLAR MOLECULES

A.H. Barrett, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (AST77-12960)

A program of microwave spectroscopic studies of the interstellar gas will be continued. The observations will be of carbon monoxide (CO), carbon monosulfide (CS), ammonia (NH3), formaldehyde (CH2O), methyl alcohol (CH3OH), and atomic hydrogen (H). The major portion of the program is to study the physical conditions and dynamics of dark clouds, with both high angular resolution and high spectral resolution, in the spectral lines of CO, NH3, and atomic H. The research program also includes CH3OH observations in Orion, a search for continuum emission from weak ionized hydrogen (HII) regions around reddened B stars, a study of the 1-cm, J equals 3, doublet radiation from CH2O, and a search for high-excitation NH3 transition. A CS spectrometer, now under construction, will be completed. A program of observations of galactic CS in HII regions, the galactic center, and along the galactic plane will be started. Observations of the J equals 3 doublet of CH2O and the high-excitation NH3 lines will require building a receiver 'front end' at 28 GHz to be used with existing radiometers at Haystack.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0010, PHOTOELECTRIC OBSERVATION OF LUNAR OCCULTATIONS

D.S. Evans, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (AST77-12216)

Photoelectric photometers with fast response times will be used with telescopes at the McDonald Observatory of the University of Texas to observe occultations (eclipses) of stars by the moon as it circles the sky each month, in continuation of earlier occultation researches. The path of the moon changes slightly each month, returning only after 19 years to nearly the same path. Thus, some new stars are occulted during each successive revolution of the moon about the earth, and stars of many different types can be observed in this way. During the coming year, all available occultation events will be observed with telescopes at the McDonald Observatory in West Texas. Disappearance phenomena will be covered and a serious attempt made to include a larger number of reappearances of stars at the end of the eclipse event, to obtain better balance in the results for positioning of the moon against the background of stars. There will be emphasis on events likely to yield stellar angular diameters. Discovery of additional close double stars and measures of their component separations is expected as in the past. Astrophysical implications of observations of angular diameters and multiplicity will be pursued. Improved capability for prediction of planetary occultation events will be developed and applied. A new portable occultation photometer will be constructed and used at nearby observatories to maximize by double observation the information which cam be obtained from events of high astrophysical potential.

Prior support was by NSF grant AST 74-23135.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0011, EVOLUTION AND DYNAMICS OF EXPLODING STARS

J.C. Wheeler, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (AST76-07629 A01)

This research will be devoted to a study of the final phases of the evolution of a star. The collapse of the interior of a star will be investigated. The subsequent supernova explosion, if it occurs, and the effects of neutrino degeneracy and general relativity will be examined. The late stages of evolution of intermediate mass stars will be investigated. There will also be a study of the effects of supernovae explosions in the depths of dense molecular clouds.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0012, THE SOLAR TRANSITION REGION AND CORONA

R.J. Bessey, University of Wyoming, School of Arts & Sciences, Dept. of Physics & Astronomy, *P.O. Box 3435, University Station, Laramie, Wyoming* 82070 (ATM77-21463)

As part of a continuing program of research of the Solar Chromosphere, this grant will support two related projects. The first is a program of numerical modelling of a variety of features in the low corona. Initially, the P.I.s will investigate the region of a magnetic neutral sheet, solving the hydrodynamic equations, including the interaction of the corona, considered as a plasma. Appropriate boundary conditions will be chosen and the evolution of the model with time will be studied. Of particular interest is the possibility that such a model will show evidence of features which can be interpreted as prominences. More complex configurations of magnetic fields will be considered as a second stage.

The second project is the analysis of data from the series of eclipse observations obtained by the staff of Los Alamos Scientific Laboratory, and provided by them for reduction. These data, in the form of Fabry-Perot interferograms, will be reduced by fast Fourier transform techniques, as has been done for earlier eclipses in the Los Alamos series. In addition to the usual dynamics, temperature, and density interpretations, a search for evidence of instabilities, and time-dependent behavior of the corona will be made.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N79-13997* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING. A CONTINUING BIBLIOGRAPHY WITH INDEXES. SUPPLEMENT 102
Dec. 1978 102 p
(NASA-SP-7037(102)) Avail: NTIS HC E02 CSCL 01A

This bibliography lists 326 reports, articles, and other documents introduced into the NASA scientific and technical information system in October 1978. Author

N79-13998# Technology, Inc., Dayton, Ohio.
STRUCTURAL AREA INSPECTION FREQUENCY EVALUATION (SAIFE). VOLUME 1: EXECUTIVE SUMMARY Final Report
Carter J. Dinkeloo and Martin S. Moran Apr. 1978 44 p refs
(Contract DOT-FA74WA-3493)
(AD-A059730; FAA-RD-78-29-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 01/3

To assist in the evaluation of proposed structural inspection programs for commercial jet transport aircraft, a logic was developed to simulate structural defects, failures, and inspections. This logic was incorporated in a computer program, Structural Area Inspection Frequency Evaluation (SAIFE). SAIFE accounts for the following factors: (1) aircraft design analysis; (2) fatigue testing; (3) production, service, and corrosion defects; (4) probability of crack or corrosion detection; and (5) aircraft modification economics. This volume presents the SAIFE logic and documents the methodology for the decision making processes in the simulation logic. Author

N79-13999# Technology, Inc., Dayton, Ohio.
STRUCTURAL AREA INSPECTION FREQUENCY EVALUATION (SAIFE). VOLUME 3: DEMONSTRATION INPUT, INSPECTION SURVEY, AND MRR DATA Final Report
Carter J. Dinkeloo and Martin S. Moran Apr. 1978 430 p refs
(Contract DOT-FA74WA-3493)
(AD-A059537; FAA-RD-78-29-Vol-3) Avail: NTIS HC A19/MF A01 CSCL 01/3

A logic was developed to simulate structural defects, failures, and inspections for commercial jet transport aircraft. This logic was incorporated into a computer program, SAIFE (Structural Area Inspection Frequency Evaluation). Volume 3 of this five volume series is presented. This volume presents data tabulations derived from historical trends and design input data for a SAIFE demonstration problem. G.Y.

N79-14000# Technology, Inc., Dayton, Ohio.
STRUCTURAL AREA INSPECTION FREQUENCY EVALUATION (SAIFE). VOLUME 4: SOFTWARE DOCUMENTATION AND USER'S MANUAL. BOOK 1: INITIAL PROGRAM Final Report
Carter J. Dinkeloo and Martin S. Moran Apr. 1978 212 p
(Contract DOT-FA74WA-3493)
(AD-A059538; FAA-RD-78-29-Vol-4-Bk-1) Avail: NTIS HC A10/MF A01 CSCL 01/3

Volume 4 Book 1 of a five volume series presents a user's manual for the computer program SAIFE (Structural Area Inspection Frequency Evaluation). This volume contains detailed computer logic flow diagrams and a complete listing of the program which is written in SIMSCRIPT 11.5. See Volume 1 of this series for the SAIFE logic and the methodology for the decision making processes in the simulation logic. G.Y.

N79-14001# Aeronautical Center, Oklahoma City, Okla.
STRUCTURAL AREA INSPECTION FREQUENCY EVALUATION (SAIFE). VOLUME 4: SOFTWARE DOCUMENTATION AND USER'S MANUAL. BOOK 2: MODIFIED PROGRAM Final Report
James Gillespie Apr. 1978 281 p
(Contract DOT-FA74WA-3493)
(AD-A059539; FAA-RD-78-29-Vol-4-Bk-2) Avail: NTIS HC A13/MF A01 CSCL 01/3

Book 2 of Volume 4 of this five volume series is presented. This volume is a user's manual for the SAIFE (Structural Area Inspection Frequency Evaluation) computer program. It contains computer logic flow diagrams and a complete listing of the program which is written in SIMSCRIPT 11.5. G.Y.

N79-14002# Technology, Inc., Dayton, Ohio.
STRUCTURAL AREA INSPECTION FREQUENCY EVALUATION (SAIFE). VOLUME 5: RESULTS OF MODEL DEMONSTRATION Final Report
Carter J. Dinkeloo, Larry E. Clay, and Martin S. Moran Apr. 1978 163 p
(Contract DOT-FA74WA-3493)
(AD-A059540; FAA-RD-78-29-Vol-5) Avail: NTIS HC A08/MF A01 CSCL 01C

Volume 4 presents the results of the SAIFE (Structural Area Inspection Frequency Evaluation) computer program application to a hypothetical aircraft and compares these results with the service experience of operational aircraft. G.Y.

N79-14003# Federal Aviation Administration, Washington, D. C. Systems Research and Development Service.
SYSTEMS RESEARCH AND DEVELOPMENT SERVICE, 8 - 8 AUGUST 1978 Progress Report
Aug. 1978 358 p refs
(AD-A057438; FAA-RD-78-90) Avail: NTIS HC A16/MF A01 CSCL 17/7

This report contains 37 papers prepared by various divisions of the Systems Research and Development Service. Reports are included from the Air Traffic Control Systems Division--En route, Terminal, and Airport surface traffic control; Communications Division; Airport Division; Flight Information Services; Aircraft and Noise Abatement Division; Approach Landing Division; and Spectrum Management Staff. GRA

N79-14004# Texas A&M Univ., College Station. Dept. of Industrial Engineering.
REPLACEMENT PROCESS ANALYSIS Interim Report

Po-Wen Hu and Laurence L. George Jun. 1978 41 p refs (Grant AF-AFOSR-3501-78)
(AD-A059460; AFOSR-78-1283TR) Avail: NTIS HC A03/MF A01 CSCL 15/5

This report describes current work on Replacement Process Analysis. First, the importance of the actuarial method in replacement process is discussed. Some refinements of the actuarial method for renewal processes are reviewed. A Markovian representation for this method gives the actuarial method a powerful tool for obtaining distributions of replacements. Also extensions of this method to used engines are proposed. A Markovian model has been formulated for engine life distribution conditioned on the number of prior repairs. This model introduces dependency among the replacements and thus allows the quality of a replacement engine to vary in some sense. Unfortunately, a regression analysis on engine type TF33P7 for a related project shows low correlation between the engine life and the number of prior repairs. However, more statistical evidence should be gathered before abandoning this model. Finally, the effect on replacements of the randomness in flying hours among aircraft is formulated but the problem has not been solved yet. GRA

N79-14005# National Aviation Facilities Experimental Center, Atlantic City, N. J.
PROCEEDINGS OF THE FAA GENERAL AVIATION RESEARCH AND DEVELOPMENT CONFERENCE, 1ST
Nov. 1977 265 p refs Conf. held at Atlantic City, N. J., 17-18 Aug. 1977
(AD-A058933; FAA-NA-77-178) Avail: NTIS HC A12/MF A01 CSCL 01/2

The purpose of the conference was to discuss current and future FAA, R and D programs with the intent of formulating plans for conducting additional research programs in the areas most needed by General Aviation. It also was aimed at building a better working relationship with general aviation users in areas of material interest. Under Airmen, the agenda included a review of pilot training techniques, pilot judgment, and pilot medical studies in such areas as night vision, the aging process and human tolerance to impact forces. Airport projects covered included low-cost marking and lighting for small airports, low-cost fire rescue equipment and frangible light structures. Aircraft subjects discussed included improved survivability for general aviation aircraft, NASA's stall/spin program for light aircraft, and engine emissions requirements and testing. The conference also focused on aviation weather problems and what is being done to reduce their impact on general aviation operations with attention also given to FAA's flight service station modernization program. Air traffic control subjects presented included area navigation, small community microwave landing system and the role of General Aviation in the evolving Air Traffic Control System. GRA

N79-14006# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A COMPUTERIZED METHODOLOGY FOR THE IDENTIFICATION OF AIRCRAFT EQUIPMENT ITEMS FOR RELIABILITY IMPROVEMENT M.S. Thesis
Roosevelt Baker, Jr. and Daniel J. Hollingsworth Jun. 1978 108 p refs
(AD-A059566; AFIT-LSSR-31-78A) Avail: NTIS HC A06/MF A01 CSCL 01/5

The purpose of this research was to develop a model which will identify aircraft equipment items for potential reliability improvement. A model was constructed to utilize a recently compiled data base comprised of four Air Force data collection systems (G033B, D056, D041, and K051). Included in the data base are 31 active Air Force aircraft weapon systems. The model analyzes the data under three replacement policies: (1) Replace on depot condemnation, (2) Replace or repair at the base, and (3) Replace on failure. Given the estimated investment required to improve the reliability of an item, the model will estimate the benefits that would accrue in terms of reduced support cost and increased availability. The investment and benefits are used to form an estimated return-on-investment ratio. The model was exercised on the 1650 stock class of items for the 31 mission design series aircraft. The results of the model, in terms of potential candidates for reliability improvement, were discussed with personnel assigned at the Oklahoma City Air Logistics Center. Author (GRA)

N79-14007# Hughes Aircraft Co., Fullerton, Calif.
MAINTAINABILITY PREDICTION AND ANALYSIS STUDY, REVISION A Final Technical Report
T. F. Pliska, F. L. Jew, and J. E. Angus Griffiss AFB, N. Y. RADC Jul. 1978 334 p refs Revised Sponsored in part by the Naval Electron. Systems Command
(Contract F30602-76-C-0242; AF Proj. 2338)
(AD-A059753; FR-78-16-247-Rev-A; RADC-TR-78-169-Rev-A)
Avail: NTIS HC A15/MF A01 CSCL 09/1

Existing maintainability prediction techniques are not accurate estimators of current electronic equipment/system characteristics. A new time synthesis prediction technique is developed which directly relates diagnostic/isolation/test subsystem characteristics and other design characteristics to equipment/system maintainability parameters. The developed methodology includes a detailed prediction procedure for use when final design data is available, and an early prediction procedure for use when preliminary design data is available. Predicted parameters include mean time to repair, maximum (percentile) time to repair, maintenance man-hours per repair, and fault isolation resolution. Also included is a comprehensive set of time standards applicable to physical maintenance actions associated with current construction and packaging techniques. Author (GRA)

N79-14008# Office of Air Force History, Washington, D. C.
THE US AIR SERVICE IN WORLD WAR 1, VOLUME 1 Final Report
Maurer Maurer, ed. 1978 456 p Prepared in cooperation with Albert F. Simpson Historical Research Center, Maxwell AFB, Ala.
(AD-A059513) Avail: NTIS MF A01; SOD HC $10.75 CSCL 15/7

The 'Final Report' published in this volume has been taken from Air Service Information Circular (Aviation), Volume II, No. 180, 15 February 1921. Substantive changes made in the Office of the Chief of Air Service when the 'Final Report' was being prepared for publication in 1921 have been pointed out in notes provided by the editor. The source for the section on corps observation in the 'Tactical History' included in this volume is the Air Service Information Circular (Heavier-than-Air), Volume 1, No. 75, 12 June 1920; the source for the section on army observation, pursuit, day bombardment, and observation balloons is a microfilm (T-619) copy of 'Gorrell's History of the Air Service, AEF,' Ser. D, Vol. 1. The last four sections, which vary greatly in style, have been edited in the same general manner as the section on corps observation was edited when it was prepared for printing in 1920. The first part of the 'Tactical History,' a seventeen-page section entitled 'The Achievement of the Air Service,' has been omitted since a revised and edited version of the same material appears as Chapters 1-3 of the 'Final Report.' GRA

N79-14009# Army Command and General Staff Coll., Fort Leavenworth, Kansas.
TACTICAL FIGHTERS IN EUROPE. MULTI-ROLE OR SINGLE MISSION? M.S. Thesis
Stephen B. Steele 9 Jun. 1978 151 p refs
(AD-A059350) Avail: NTIS HC A08/MF A01 CSCL 01/3

The relevancy of current and projected force mixes and training doctrine was examined by focusing on effectiveness of the multi-role-single mission concepts in the past, aircraft and training requirements that are peculiar to the European environment, the Soviet threat, and current and projected United States fighter forces in Europe. Specialized aircraft such as the A-10 and F-15 are ideal in Europe, but new multi-role designs such as the F-16, based on air superiority design requirements, are also highly effective. Training, however, must be specialized to the maximum extent possible to increase aircrew proficiency and expertise to the point where the aircrew, the new technology aircraft, and the weapons are capable of blunting a major Soviet invasion in Central Europe. Author

N79-14010# Environmental Protection Agency, Ann Arbor, Mich. Standards Development and Support Branch.
US AIRCRAFT FLEET PROJECTION AND ENGINE IN-

VENTORY TO YEAR 2000
Richard W. Munt Feb. 1978 30 p refs
(PB-285189/7; AC-78-02; EPA/TSR/AC-78-02) Avail: NTIS HC A03/MF A01 CSCL 01C

A forecast of the number of aircraft gas turbine engines which must comply with the proposed revisions to the EPA emissions standards was provided, as well as an aircraft forecast (useful if other revisions are proposed). The information may be used directly to obtain estimates of the total impact of various standards and implementation dates and more importantly, to obtain estimates of the total cost and cost effectiveness of the standards. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N79-14011*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRFOIL DESIGN BY NUMERICAL OPTIMIZATION USING A MINICOMPUTER
Raymond M. Hicks and C. A. Szelazek (Computer Information Systems, Cupertino, Calif.) Dec. 1978 28 p refs
(NASA-TM-78502; A-7505) Avail: NTIS HC A03/MF A01 CSCL 01A

A computer program developed for the automated design of low speed airfoils utilizes a generalized Joukowski method for aerodynamic analysis coupled with a conjugate gradient, penalty function, numerical optimization algorithm to give an efficient calculation technique for use with minicomputers. The program designs airfoils with a prescribed pressure distribution as well as those which minimize or maximize some aerodynamic force coefficient. At present the method is restricted to inviscid, incompressible flow. A typical design problem will execute in 4.5 hr on an HP 9830 minicomputer. A.R.H.

N79-14012*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF AN ALTERNATE WINGLET ON THE PRESSURE AND SPANWISE LOAD DISTRIBUTIONS OF A FIRST GENERATION JET TRANSPORT WING
Lawrence C. Montoya (NASA Dryden Flight Research Center), Stuart G. Flechner, and Peter F. Jacobs Dec. 1978 95 p refs
(NASA-TM-78786; L-12519) Avail: NTIS HC A05/MF A01 CSCL 01A

Pressure and spanwise load distributions on a first-generation jet transport semispan model at subsonic speeds are presented. The wind tunnel data were measured for the wing with and without an alternate winglet. The results show that the winglet affected outboard wing pressure distributions and increased the spanwise loads near the tip. Author

N79-14013*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF CANARD VERTICAL LOCATION, SIZE, AND DEFLECTION ON CANARD-WING INTERFERENCE AT SUBSONIC SPEEDS
Blair B. Gloss, Edward J. Ray, and Karen E. Washburn Dec. 1978 120 p refs
(NASA-TM-78790; L-12523) Avail: NTIS HC A06/MF A01 CSCL 01A

A generalized close-coupled canard-wing configuration was tested in a high speed 7 by 10 foot tunnel at Mach numbers of 0.40, 0.70, and 0.85 over an angle-of-attack range from -4 deg to 24 deg. Studies were made to determine the effects of canard vertical location, size, and deflection and wing leading-edge sweep on the longitudinal characteristics of the basic configuration. The two wings tested had thin symmetrical circular-arc airfoil sections with characteristically sharp leading edges swept at 60 deg and 44 deg. Two balances which allow separation of the canard-forebody contribution from the total forces and moments were used in this study. G.G.

N79-14014*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
DESIGN AND PHYSICAL CHARACTERISTICS OF THE TRANSONIC AIRCRAFT TECHNOLOGY (TACT) RESEARCH AIRCRAFT
Weneth D. Painter and Lawrence J. Caw Jan. 1978 32 p refs
(NASA-TM-56048; H-976) Avail: NTIS HC A03/MF A01 CSCL 01A

The Transonic Aircraft Technology (TACT) research program provided data necessary to verify aerodynamic concepts, such as the supercritical wing, and to gain the confidence required for the application of such technology to advanced high performance aircraft. An F-111A aircraft was employed as the flight test bed to provide full scale data. The data were correlated extensively with predictions based on data obtained from wind tunnel tests. An assessment of the improvement afforded at transonic speeds in drag divergence, maneuvering performance, and airplane handling qualities by the use of the supercritical wing was included in the program. Transonic flight and wind tunnel testing techniques were investigated, and specific research technologies evaluated were also summarized. B.B.

N79-14015*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INITIAL FEASIBILITY STUDY OF A MICROWAVE-POWERED SAILPLANE AS A HIGH-ALTITUDE OBSERVATION PLATFORM
Harry H. Heyson Dec. 1978 17 p refs
(NASA-TM-78809) Avail: NTIS HC A02/MF A01 CSCL 01C

It is shown that a microwave-powered sailplane can be a reasonable substitute for a satellite in some missions requiring only limited coverage of the surface of the earth. A mode of operation in which the aircraft cyclically climbs to high altitude in the beam, and then glides for several hundred kilometers, is feasible and takes advantage of the inherent forward speed of the sailplane at high altitude. G.G.

N79-14016*# McDonnell Aircraft Co., St. Louis, Mo.
FEASIBILITY OF COMBINING LINEAR THEORY AND IMPACT THEORY METHODS FOR THE ANALYSIS AND DESIGN OF HIGH SPEED CONFIGURATIONS
Final Report
D. Brooke and D. V. Vondrasek Dec. 1978 42 p refs
(Contract NAS1-15074)
(NASA-CR-3069) Avail: NTIS HC A03/MF A01 CSCL 01A

The aerodynamic influence coefficients calculated using an existing linear theory program were used to modify the pressures calculated using impact theory. Application of the combined approach to several wing-alone configurations shows that the combined approach gives improved predictions of the local pressure and loadings over either linear theory alone or impact theory alone. The approach not only removes most of the short-comings of the individual methods, as applied in the Mach 4 to 8 range, but also provides the basis for an inverse design procedure applicable to high speed configurations. G.Y.

N79-14017*# Flow Research, Inc., Kent, Wash.
NUMERICAL COMPUTATION OF TRANSONIC FLOWS BY FINITE-ELEMENT AND FINITE-DIFFERENCE METHODS
M. M. Hafez, L. C. Wellford, C. L. Merkle, and E. M. Murman Dec. 1978 123 p refs
(Contract NAS1-14246)
(NASA-CR-3070) Avail: NTIS HC A06/MF A01 CSCL 01A

Studies on applications of the finite element approach to transonic flow calculations are reported. Different discretization techniques of the differential equations and boundary conditions are compared. Finite element analogs of Murman's mixed type finite difference operators for small disturbance formulations were constructed and the time dependent approach (using finite differences in time and finite elements in space) was examined. B.B.

N79-14018*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

LOW-SPEED AERODYNAMIC CHARACTERISTICS OF A 16-PERCENT-THICK VARIABLE-GEOMETRY AIRFOIL DESIGNED FOR GENERAL AVIATION APPLICATIONS

Richard W. Barnwell, Kevin W. Noonan, and Robert J. McGhee Dec. 1978 77 p refs Prepared in cooperation with Army Aviation Research and Development Command, St. Louis, Mo. (DA Proj. 1L1-61102-AH-45)

(NASA-TP-1324; AVRADCOM-TR-78-45) Avail: NTIS HC A05/MF A01 CSCL 01A

Tests were conducted in the Langley low-turbulence pressure tunnel to determine the aerodynamic characteristics of climb, cruise, and landing configurations. These tests were conducted over a Mach number range from 0.10 to 0.35, a chord Reynolds number range from 2.0 x 1 million to 20.0 x 1 million, and an angle-of-attack range from -8 deg to 20 deg. Results show that the maximum section lift coefficients increased in the Reynolds number range from 2.0 x 1 million to 9.0 x 1 million and reached values of approximately 2.1, 1.8, and 1.5 for the landing, climb, and cruise configurations, respectively. Stall characteristics, although of the trailing-edge type, were abrupt. The section lift-drag ratio of the climb configuration with fixed transition near the leading edge was about 78 at a lift coefficient of 0.9, a Mach number of 0.15, and a Reynolds number of 4.0 x 1 million. Design lift coefficients of 0.9 and 0.4 for the climb and cruise configurations were obtained at the same angle of attack, about 6 deg, as intended. Good agreement was obtained between experimental results and the predictions of a viscous, attached-flow theoretical method. S.E.S.

N79-14019*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

A LASER VELOCIMETER FLOW SURVEY ABOVE A STALLED WING

Warren H. Young, Jr., James F. Meyers, and Danny R. Hoad Dec. 1978 138 p refs Prepared in cooperation with Army Aviation Research and Development Command, St. Louis, Mo. (DA Proj. 1L1-61102-AH-45)

(NASA-TP-1266; AVRADCOM-TR-78-50) Avail: NTIS HC A07/MF A01 CSCL 01A

A laser velocimeter operating in the backscatter mode was used to survey the flow about a stalled wing installed in the Langley V/STOL tunnel. Mean velocities and magnitudes of velocity fluctuations were calculated from measurements of two orthogonal components of velocity. Free shear mixing layers above and below a large separated flow region were defined. Velocity power spectra were calculated at two points in the flow field. The flow-field survey was carried out about a rectangular aspect-ratio-8 wing with an airfoil section. The wing angle of attack was 19.4 deg, the Mach number was 0.148, and the nominal Reynolds number was 1 x 1 million. Author

N79-14020*# General Dynamics/Fort Worth, Tex.

A METHOD FOR PREDICTING FULL SCALE BUFFET RESPONSE WITH RIGID WIND TUNNEL MODEL FLUCTUATING PRESSURE DATA. VOLUME 1: PREDICTION METHOD DEVELOPMENT AND ASSESSMENT

Atlee M. Cunningham, Jr., David B. Benepe, Darlene Watts, and Paul G. Waner Nov. 1978 147 p refs

(Contract NAS2-7091)

(NASA-CR-3035) Avail: NTIS HC A07/MF A01 CSCL 01A

The method requires unsteady aerodynamic forces, natural airplane modes, and the measured pressure data as input. A gust response computer program is used to calculate buffet response due to the forcing function posed by the measured pressure data. By calculating both symmetric and antisymmetric solutions, upper and lower bounds on full-scale buffet response are formed. Comparisons of predictions with flight test results are made and the effects of horizontal tail loads and static aeroelasticity are shown. Discussions are also presented on the effects of primary wing torsion modes, chordwise and spanwise phase angles, and altitude. Author

N79-14021*# General Dynamics/Fort Worth, Tex.

A METHOD FOR PREDICTING FULL SCALE BUFFET RESPONSE WITH RIGID WIND TUNNEL MODEL FLUCTUATING PRESSURE DATA. VOLUME 2: POWER SPECTRAL DENSITIES FOR METHOD ASSESSMENT

Atlee M. Cunningham, Jr., David B. Benepe, Darlene Watts, and Paul G. Waner Nov. 1978 239 p

(Contract NAS2-7091)

(NASA-CR-3036) Avail: NTIS HC A11/MF A01 CSCL 01A

The predicted upper and lower bounds power spectra for all of the cases and response items given in Volume 1 are plotted. The flight test power spectra are shown on each prediction plot for the nominal value of angle of attack that most closely agrees with the flexible angle for the prediction. The flight test and prediction conditions are given in tabular form for all cases considered. F.O.S

N79-14022*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

VORTEX EFFECTS FOR CANARD-WING CONFIGURATIONS AT HIGH ANGLES OF ATTACK IN SUBSONIC FLOW

B. M. E. deSilva and R. T. Medan Dec. 1978 32 p refs

(NASA-TM-78543; A-7677) Avail: NTIS HC A03/MF A01 CSCL 01A

A fully three-dimensional subsonic panel method that can handle arbitrary shed vortex wakes is used to compute the nonlinear forces and moments on simple canard-wing configurations. The lifting surfaces and wakes are represented by doublet panels. The Mangler-Smith theory is used to provide an initial estimate for the vortex sheet shed from the leading edge. The trailing-edge wake and the leading-edge wake downstream of the trailing edge are assumed to be straight and leave the trailing edge at an angle of alpha/2. Results indicate good agreement with experimental data up to 40 degs angle of attack. Author

N79-14023*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THEORETICAL EVALUATION OF HIGH-SPEED AERODYNAMICS FOR ARROW-WING CONFIGURATIONS

Samuel M. Dollyhigh Jan. 1979 67 p refs

(NASA-TP-1358; L-12485) Avail: NTIS HC A04/MF A01 CSCL 01A

The use of the theoretical methods to calculate the high-speed aerodynamic characteristics of arrow-wing supersonic cruise configurations was studied. Included are correlations of theoretical predictions with wind-tunnel data at Mach numbers from 0.8 to 2.7, examples of the use of theoretical methods to extrapolate the wind-tunnel data to full-scale flight condition, and presentation of a typical supersonic data package for an advanced supersonic transport application. A brief description of the methods and their application is given. G.G.

N79-14024*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EFFECTS OF UPPER SURFACE MODIFICATION ON THE AERODYNAMIC CHARACTERISTICS OF THE NACA 63 SUB 2-215 AIRFOIL SECTION

Raymond M. Hicks and Edward T. Schairer Jan. 1979 27 p refs

(NASA-TM-78503; A-7507) Avail: NTIS HC A03/MF A01 CSCL 01A

An upper surface modification designed to increase the maximum lift coefficient of a 63 sub 2 - 215 airfoil section was tested at Mach numbers of 0.2, 0.3, and 0.4 Reynolds numbers of 1.3 x 1 million, 2 x 10 sub 6 and 2.5 x 1 million. Comparisons of the aerodynamic coefficients before and after the modification were made. The upper surface modification increased the maximum lift coefficient of the airfoil significantly at all conditions. G.G.

N79-14025*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

AERODYNAMIC CHARACTERISTICS OF A SUPERSONIC CRUISE AIRPLANE CONFIGURATION AT MACH NUMBERS OF 2.30, 2.96, AND 3.30

Barrett L. Shrout and Roger H. Fournier Jan. 1979 143 p refs

(NASA-TM-78792; L-12570) Avail: NTIS HC A07/MF A01 CSCL 01A

An investigation was made in the Langley Unitary Plan wind tunnel at Mach numbers of 2.30, 2.96, and 3.30 to determine the static longitudinal and lateral aerodynamic characteristics of a model of a supersonic cruise airplane. The configuration, with a design Mach number of 3.0, has a highly swept arrow wing

with tip panels of lesser sweep, a fuselage chine, outboard vertical tails, and outboard engines mounted in nacelles beneath the wings. For wind tunnel test conditions, a trimmed value above 6.0 of the maximum lift-drag ratio was obtained at the design Mach number. The configuration was statically stable, both longitudinally and laterally. Data are presented for variations of vertical-tail roll-out and toe-in and for various combinations of components. Some roll control data are shown as are data for the various sand grit sizes used in fixing the boundary layer transition location. Author

N79-14026# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
AIRCRAFT WAKE VORTEX CHARACTERISTICS FROM DATA MEASURED AT JOHN F. KENNEDY INTERNATIONAL AIRPORT Final Report, Jun. 1975 - Jun. 1977
W. R. Eberle, M. R. Brashears, A. D. Zalay, K.R. Shrider, and D. A. Love Mar. 1978 254 p refs
(Contract DOT-TSC-1023)
(AD-A055059; LMSC-HREC-TR-D568181; FAA-RD-78-47; FAA-78-5) Avail: NTIS HC A12/MF A01 CSCL 20/4

Data from 1320 aircraft flybys at Kennedy International Airport, Jamaica, New York, in 1975 were processed and stored in a computerized vortex data management system. The data were selectively recalled to determine vortex characteristics pertinent to the design of an effective wake vortex avoidance system. Vortex and meteorological characteristics which are relevant to the design of an effective wake vortex avoidance system are discussed from an analytical viewpoint as well as from an analysis of the data. Several formulations for feedback of vortex sensor information to provide vortex prediction are presented. Several wake vortex avoidance system designs are shown. Author (GRA)

N79-14027# Notre Dame Univ., Ind. Dept. of Aerospace and Mechanical Engineering.
SMOKE VISUALIZATION OF SUBSONIC AND SUPERSONIC FLOWS (THE LEGACY OF F. N. M. BROWN) Final Report
Thomas J. Mueller Jun. 1978 106 p refs
(Grant AF-AFOSR-3412-77)
(AD-A059443; UNDAS-TN-3412-1; AFOSR-78-1262TR) Avail: NTIS HC A06/MF A01 CSCL 20/4

There has been a great interest throughout the history of aerodynamics in making flow patterns visible. In addition to the qualitative picture of the flow hoped for, the possibility of obtaining quantitative flow measurements without introducing probes which invariably disturb the flow has provided the necessary incentive for development of these techniques. The past experience related to smoke visualization in wind tunnels is presented, with particular emphasis on the work of F.N.M. Brown. A detailed description of these state-of-the-art techniques and typical qualitative and quantitative results obtained are also presented. Author (GRA)

N79-14028# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CALCULATION OF AERODYNAMIC PRESSURE DISTRIBUTIONS ON ARBITRARY AIRCRAFT GEOMETRIES USING THE WOODWARD AERODYNAMIC ANALYSIS PROGRAM M.S. Thesis
Glynn E. Sisson Sep. 1977 99 p refs
(AD-A059709; AFIT/GAE/AE/77S-2) Avail: NTIS HC A05/MF A01 CSCL 20/4

There is a frequent need for accurate aerodynamic force data in preliminary design. Data must be available on many configurations, some of which deviate significantly from existing aircraft. A method which fills the gap between statistically based predictions and wind tunnel testing is a computer solution to the linearized potential flow equations of motion. The Woodward USSAERO program was selected to calculate potential flow force distributions on arbitrary aircraft geometry. Five major aspects of the program insure that the program is capable of supplying the required data. They are the differential equation, boundary conditions, singularity types, matrix operations, and force and moment calculations. In order to operate this program in the preliminary design environment, it was interfaced with existing geometry data bases with a separate Interface program. A third program, the Geometry program, was written to speed the definition of a complete aircraft configuration in a format compatible with several existing analysis programs. It defines arbitrary fuselage geometry as a series of cross-sections using an interactive terminal and digitizer. It defines lifting surface geometry as a series of streamwise airfoil sections with several different airfoil shapes being available. The system of programs were applied to the F-111A aircraft as an example case. The results of that analysis show excellent agreement with wind tunnel data for pressure distributions on the wing at moderately high subsonic Mach numbers. GRA

N79-14029# Detroit Diesel Allison, Indianapolis, Ind.
RESEARCH ON AEROELASTIC PHENOMENA IN THIN AIRFOIL CASCADES Final Summary Report
Sanford Fleeter Aug. 1978 56 p refs
(Contract N00014-72-C-0351)
(AD-A059718; DDA-EDR-9575) Avail: NTIS HC A04/MF A01 CSCL 21/5

The advent of high tip, high work, blading in the fan stages of advanced gas turbine engines has led to the recognition of a new type of blading instability - unstalled supersonic flutter. As a result, a concerted effort to develop an appropriate predictive mathematical model has taken place. To determine the range of validity and to direct refinements to the basic flow model, fundamental supersonic oscillating cascade data are required. This is the report for an experimental research program directed at obtaining these unique time-variant aerodynamic data. The approach involved harmonically oscillating dynamically instrumented 2-D rectilinear cascades of airfoils in a supersonic inlet flow field, with the unsteady operation of the cascade computer controlled. Data were obtained in both torsion and translation over a range of steady and time-variant aerodynamic conditions. All of these data were then correlated with predictions obtained from a current state-of-the-art model. GRA

N79-14030# ARO, Inc., Arnold Air Force Station, Tenn.
A SUMMARY REPORT ON STORE HEATING TECHNOLOGY Final Report, Mar. 1977 - Apr. 1978
R. K. Matthews AEDC Sep. 1978 56 p refs
(AF Proj. 2567)
(AD-A059415; AEDC-TR-78-46) Avail: NTIS HC A04/MF A01 CSCL 01/3

One of the problem areas associated with the supersonic carriage of external stores is concerned with temperature restrictions on critical components. Theoretical calculations were used to guide a two-phase experimental program which included both flight and wind tunnel testing. Flight heat-transfer measurements were obtained on a pylon-mounted BDU-12 at flight conditions of 40,000 ft and Mach numbers up to 2.5. The wind tunnel tests of a 1/15 scale model included both pressure and heat transfer measurements on the flight test configuration plus several others. The results are discussed in three categories; wind tunnel, flight test, and correlation of wind tunnel and flight data. This work has clearly shown the flight capability for supersonic carriage of large stores and has demonstrated some of the available technology for defining thermal environments. Author (GRA)

N79-14031# Transportation Systems Center, Cambridge, Mass.
PROCEEDINGS OF THE AIRCRAFT WAKE VORTICES CONFERENCE
J. N. Hallock, ed. Jun. 1977 354 p Conf. held at the Transportation Systems Center, Kendall Square, Cambridge, Mass., 15-17 Mar. 1977 Sponsored by FAA
(AD-A055510; DOT-TSC-FAA-77-12) Avail: NTIS HC A16/MF A01 CSCL 01/2

This volume contains the proceedings of a conference on aircraft wake vortices. The contributed papers discuss technological advances in the knowledge of the phenomenon, its effects on aircraft, alleviation techniques, and vortex avoidance systems designed to permit decreases in delays at major airports. GRA

N79-14032# Transportation Systems Center, Cambridge, Mass.
JOINT US/UK VORTEX TRACKING PROGRAM AT HEATHROW INTERNATIONAL AIRPORT. VOLUME 2: DATA ANALYSIS Final Report, Apr. 1974 - May 1977
J. N. Hallock, B. P. Winston, D. C. Burnham, T. E. Sullivan, I. G. McWilliams, and W. D. Wood Nov. 1977 197 p refs

(AD-A048308; DOT-TSC-FAA-76-11-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 20/4

From May 1974 through June 1975, the approach region to runway 28R at Heathrow International Airport was equipped with aircraft wake vortex tracking equipment. The vortices from approximately 13,000 aircraft were monitored along with the attendant meteorological conditions. The joint US/UK project represents a major step in learning how vortices move and die in the terminal environment. Volume 2 describes the entire project from the workings and locations of the equipment to the analysis of the data. GRA

N79-14033# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
AUTOMATIC TRACKING OF WAKE VORTICES USING GROUND-WIND SENSOR DATA Final Report, May 1975 - Apr. 1976
John J. Deyst, Jr. and Saul Serben 3 Jan. 1977 95 p
(Contract DOT-TSC-1024)
(AD-A047895; R-1009; FAA-RD-77-11) Avail: NTIS HC A05/MF A01 CSCL 20/4

Algorithms for automatic tracking of wake vortices using ground-wind anemometer data are developed. Methods of bad-data suppression, track initiation, and track termination are included. An effective sensor-failure detection-and-identification system is also documented. System performance is verified using actual sensor data. Computer requirements for implementing the system in the field are summarized, and a plan for developing a general-purpose vortex-tracking simulation is presented. GRA

N79-14034# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
LASER DOPPLER VELOCIMETER MEASUREMENTS OF B-747 WAKE VORTEX CHARACTERISTICS Final Report, Nov. 1975 - Jan. 1977
M. R. Brashears and A. D. Zalay Sep. 1977 220 p refs
(Contract DOT-TSC-1145)
(AD-A048275; LMSC-HREC-TR-D496975; FAA-RD-77-85; FAA-77-13) Avail: NTIS HC A10/MF A01 CSCL 01/1

To determine the behavior of the wake vortices of a B-747 at low altitudes and to measure the vortex-decay process behind the B-747 as a function of altitude above ground, flap and spoiler settings, and different flight configurations, a B-747 aircraft flew 54 passes at low level over a ground-based Laser Doppler Velocimeter (LDV) system. From the LDV measurements, the location and flow field of the wake vortices and the general vortex roll-up, transport, and decay trends were obtained. Results of the study indicated that the deployment of spoilers and flaps enhanced the decay of the vortex peak tangential velocity in the near wake while aircraft altitude, glide slope, and landing gear deployment had little effect. The report discusses the LDV wake vortex measurements including the instrumentation used, the experimental test sequence, the results of the wake measurements in terms of the vortex roll-up, transport, and decay trends, and a comparison of the wake vortex characteristics for different configurations. Author (GRA)

N79-14035# ARO, Inc., Arnold Air Force Station, Tenn.
TEST RESULTS FROM THE PRESSURE PHASE OF THE FLOW DIAGNOSTICS APPLICATIONS TEST CONDUCTED IN THE AEDC-VKF TUNNEL C Final Report, 26 Jun. 1978 - 7 Jul. 1978
Kenneth Nutt and David H. Fikes Aug. 1978 27 p
(AD-A060224; AEDC-TSR-78-1/22) Avail: NTIS HC A03/MF A01 CSCL 20/4

Tests were conducted in the AEDC-VKF Hypersonic Wind Tunnel C to obtain pressure measurements on the tunnel nozzle wall and surface static pressures and pitot pressure on a 5 deg cone model with either a sharp or a blunt (r_n = 0.375 in.) nose. The pressure measurements were obtained to provide comparative data for laser scattering measurements of the temperature and number density of both the tunnel free stream and the leeside of the 5 deg cone. The test was conducted at Mach number 10 with the tunnel stagnation pressure and temperature varying from 400 to 1480 psia and 750 R to 2160 R, respectively. The tunnel dew point (frost point) varied from 394 R to 476 R. A test description is presented. Author (GRA)

N79-14036# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.
EFFECT OF STRUCTURAL PARAMETERS ON THE FLAP-LAG RESPONSE OF A ROTOR BLADE IN FORWARD FLIGHT Interim Technical Report, Mar. 1977 - Jun. 1978
David A. Peters and Daniel P. Schrage Jul. 1978 107 p refs
(Grant DAAG29-77-G-0103)
(AD-A060331; ARO-14585.1-E; ITR-1) Avail: NTIS HC A06/MF A01 CSCL 01/3

A study is made of the effect of structural coupling on the vibrations of rigid, centrally hinged rotor blades. In particular, if the parameter combinations that result in desirable stability characteristics might also result in good vibrational characteristics. In order to determine the stability and vibrations simultaneously, a new analytical method, based on eigenvalue and modal decoupling, is developed to solve for the eigenvalues and forced response of systems of equations with periodic coefficients. This method is then applied to the linearized equations of motion for rotor flap-lag in forward flight. Unlike conventional linear analyses, however, this analysis retains the nonlinear terms as added forcing functions. GRA

N79-14037# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering and Applied Mechanics.
NUMERICAL SOLUTIONS OF THE TRIPLE-DECK EQUATIONS FOR SUPERSONIC AND SUBSONIC FLOW PAST A HUMP Final Report, 1 Oct. 1976 - 30 Sep. 1978
M. Napolitano, M. J. Werle, and R. T. Davis Jun. 1978 112 p refs
(Contract N00014-76-C-0359)
(AD-A060203; AFL-78-6-42) Avail: NTIS HC A06/MF A01 CSCL 20/4

This study presents a numerical technique for solving the fundamental Triple-Deck problem. Supersonic and subsonic flow past a hump on a flat plate are considered as a test case. Author (GRA)

N79-14038# McDonnell Aircraft Co., St. Louis, Mo.
LIFT SYSTEM INDUCED AERODYNAMICS OF V/STOL AIRCRAFT IN A MOVING DECK ENVIRONMENT. VOLUME 1: TECHNICAL DISCUSSION Final Technical Report, 30 Sep. 1977 - 29 Sep. 1978
James H. Kamman and Charles L. Hall 29 Sep. 1978 192 p refs
(Contract N62269-77-C-0365)
(AD-A060206; NADC-77107-30-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 01/2

The propulsive lift system induced aerodynamics of multi-jet V/STOL aircraft configurations were experimentally evaluated over a moving deck and at static hover conditions. Several model configurations representative of advanced subsonic and supersonic V/STOL aircraft were tested. Dynamic jet-induced force and moment data were obtained for heaving, pitching, and rolling motions of a simulated seaborne landing platform over a range of heights, amplitudes, and frequencies. Configuration effects were assessed at both static hover and deck motion conditions, including the effects of wing height, fuselage contouring, lift improvement devices, and nozzle arrangement. In addition, tests were performed to separate the effects of deck motion on the fountain impingement forces. Empirical procedures were defined to aid in predicting the dynamic jet-induced forces and moment variations with deck motion. Configuration design and model testing guidelines for V/STOL aircraft are described. Recommendations are also made for further research to provide additional information required to develop generalized prediction procedures. Author (GRA)

N79-14039# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
UNSTEADY LAMINAR SEPARATION: AN EXPERIMENTAL STUDY Final Report, 15 Nov. 1974 - 31 May 1978
D. P. Telionis and C. A. Koromilas Aug. 1978 138 p refs
(Grant DAHC04-75-G-0067)
(AD-A060031; VPI-E-78-24; ARO-12680.5-E) Avail: NTIS HC A07/MF A01 CSCL 20/4

The design of most aerodynamic surfaces, as for example the helicopter rotor, is based essentially on quasi-steady theories. However, the dynamics of a rotating blade introduce unexpected

fluctuations and overshoots of properties like lift, drag, etc. The phenomenon of unsteady stall is intimately connected with the development of an oscillating boundary layer and separation. Experimental investigation of such flows was undertaken by a method of visualization developed especially for the study of laminar or turbulent boundary layers and separation. The method captures the instantaneous 2-D flow field, including regions of separated flow and provides accurate quantitative information. Laser Doppler anemometer measurements complement the optically received data. Results reveal that separation responds with time-lag to external disturbances, in agreement with unsteady stall data. Oscillating outer flows result in displacement of the point of separation and under certain conditions, the Despard and Miller criterion was found to hold. Earlier theoretical models of separation are confirmed qualitatively and for the early stages of the transient phenomena. The findings provide physical insight and quantitative data that may help understand the phenomenon of unsteady stall and unsteady separation. Author (GRA)

N79-14040# Illinois Inst. of Tech., Chicago. Dept. of Mechanics, Mechanical and Aerospace Engineering.
AN EXPERIMENTAL INVESTIGATION OF THE NEAR WAKE OF A CIRCULAR CYLINDER IN THE SUBCRITICAL REGIME Interim Report
Richard W. Wlezien and John L. Way May 1976 140 p refs
(Contract F44620-76-C-0062; Grant AF-AFOSR-2509-73; AF Proj. 2307)
(AD-A059530; ITT-FLUIDS/HEAT-TRANS-R76-3; AFOSR-78-1292TR) Avail: NTIS HC A07/MF A01 CSCL 20/4

The near wake of a circular cylinder in crossflow is experimentally investigated for Reynolds number 7600. The purpose is to develop techniques for characterizing the formation region of the Karman vortex street in presence of transition to turbulence and to use these techniques to examine the quasi-periodic vortex shedding phenomenon. A thermal tracer is used to tag vortical fluid in one of the cylinder boundary layers and this scalar is subsequently detected in the wake. The instantaneous phase of the amplitude and frequency modulated poly-chromatic vortex shedding phenomenon is computed using a digital Hilbert transform technique. This method is a generalization of the monochromatic complex rotating vector to processes which are modulated. The computed phase is used to conditionally sample the wake temperature using a six-sensor resistance thermometer array, and the resulting data are processed using statistical methods. Results demonstrate that the near wake region contains diffuse vortical fluid and this fluid has a role in the shar layer instability. The statistics also show the formation and shedding of a mean Karman vortex, and lead to a possible explanation of the modulation process. Author (GRA)

N79-14041# Naval Postgraduate School, Monterey, Calif.
A MATHEMATICAL MODEL FOR TURBULENT FLOWS INVOLVING SUPERSONIC, SUBSONIC AND RECIRCULATING REGIONS Final Report, 1977 - 1978
T. H. Gawain Jul. 1978 112 p refs
(AD-A059522; NPS-67GN-78-003) Avail: NTIS HC A06/MF A01 CSCL 20/4

In connection with the development of a dual chamber rocket, the need arose for a mathematical model capable of simulating the flow field involved. The flow is turbulent and includes supersonic, subsonic and recirculating regions. Such a model is fully described in this report. Turbulence effects are accounted for by an eddy viscosity hypothesis, and by suitable coefficients of mass, energy and entropy transport. It was found that these turbulence effects radically change the elliptically/hyperbolic characteristics of the equations as compared with the classicial case of nonturbulent compressible flow. The equations of momentum, continuity and energy for turbulent flow are shown to be elliptical for both supersonic and subsonic regions. When the second law of thermodynamics is added, the equations assume a parabolic character. This report explains how the field may be subdivided into finite cells and the solution marched downstream cell by cell. Author (GRA)

N79-14042# Naval Postgraduate School, Monterey, Calif.
CASCADE WIND TUNNEL FOR TRANSONIC COMPRESSOR BLADING STUDIES M.S. Thesis
Willard Joe Demo, Jr. Jun. 1978 112 p refs
(AD-A059532) Avail: NTIS HC A06/MF A01 CSCL 20/4

The design and construction of a small, transonic, cascade wind tunnel are reported. The tunnel is of the intermittent blow-down type, and the initial test cascade models the flow at the rotor blade tips of a single stage transonic compressor at a relative Mach number of 1.4. General programs were developed for the design of round-to-rectangular transition sections and for the computation of supersonic nozzle contours. Complete machine drawings for the important components of the facility are included. Author (GRA)

N79-14043# McDonnell-Douglas Research Labs., St. Louis, Mo.
UNSTEADY TRANSONIC DIFFUSER FLOWS IN A TWO-DIMENSIONAL DIFFUSER Annual Report, 1 Apr. 1977 - 31 Mar. 1978
M. Sajben and J. C. Kroutil May 1978 31 p refs
(Contract F49620-77-C-0082)
(AD-A059437; MDC-Q0651; AFOSR-78-1277TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

The present study is part of a continuing investigation of unsteady, transonic diffuser flows, with application to dynamic distortion in the inlets of fighter aircraft and airbreathing missile propulsion systems. The investigation is focused on a simple, two-dimensional diffuser configuration displaying a weak shock shortly downstream of the throat. Flows in this model were found to display self-excited oscillations involving the shock and the entire subsonic flow behind it. The shock displacement amplitudes are comparable to the throat height and occur at frequencies characterized by the flow speed and the length of the divergent diffuser section. The time-mean and fluctuating properties of this flow and the dependence of these properties on shock strength have been documented. GRA

N79-14044# University of Southern Calif., Los Angeles. Dept. of Aerospace Engineering.
THEORY OF OBLIQUE WINGS OF HIGH ASPECT RATIO
H. K. Cheng May 1978 45 p refs
(Contract N00014-75-C-0520)
(AD-A059798; USCAE-135) Avail: NTIS HC A03/MF A01 CSCL 20/4

The aerodynamic characteristics of oblique wings in an inviscid, incompressible flow, linearized for small wing camber and incidence, are studied under the assumption that the wing aspect ratio is high. The present analysis differs from the classical lifting-line theory in that the flow field next to the wing section (the inner solution) is affected by a component of the wake vorticity parallel to the center line, and, hence, is not locally two-dimensional. A crucial aspect of the analysis involves the behavior of the three-dimensional corrections near the leading and trailing edges, which require special attention, lest nonuniformities arise. The results determined from matching the inner and outer solutions exhibit a strong asymmetrical spanwise influence of the wake vorticities, with a lift increase on the downstream wing panel and a lift reduction on the upstream panel. Results obtained are compared with surface-lift distributions generated by an inversed method for yawed elliptic planforms, and with span loadings generated by a panel method for elliptic flat plates (wings with zero camber) as well as an ESP (extended-span planform) wing. GRA

N79-14045# Tennessee Univ. Space Inst., Tullahoma.
MISSILE VORTEX WAKE MEASUREMENTS Final Report, 1 Mar. 1977 - 30 Jun. 1978
Kenneth E. Harwell and W. Michael Farmer 31 Aug. 1978 52 p refs
(Grant DAAG29-77-G-0107)
(AD-A059783; ARO-14921.1-AE) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report describes the preliminary results obtained using a dual scatter, moving fringe laser velocimeter system to measure the velocity field downstream of a missile body at high angles of attack. The measurements were made in the NASA/Marshall Space Flight Center Bisonic Wind Tunnel. Problems associated with excessive amounts of oil in the flow prevented a complete characterization of the flow field. Two components of velocity were measured in two planes downstream of the missile nose

at an angle of attack of 19.5 deg. The mean velocity, turbulent intensity and kurtosis of the probability density distribution were determined at 45 spatial locations. The mean flow velocity of the wind tunnel freestream was found to oscillate about the mean flow with a time period between 3 and 4 seconds. The mean horizontal velocity component did not vary appreciably (less than 1 ft/sec out of 300 ft/sec), but the vertical component of velocity exhibited both positive and negative components in the vortex flow. Velocity histograms and modal velocities were determined at each spatial location. The report describes the UTSI laser velocimeter system and makes recommendations for its future use in characterizing the missile vortex flows.

Author (GRA)

N79-14046# Systems Research Labs., Inc., Newport News, Va.

A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF VORTEX FLOW CONTROL FOR HIGH LIFT GENERATION Interim Report, 1 Jan. - 31 Dec. 1977

Richard P. White, Jr., Santu T. Gangwani, and D. S. Janak Ram Mar. 1978 136 p refs

(Contract N00014-74-C-0091)

(AD-A059638; RASA/SRL-14-78-1; ONR-CR212-223-4) Avail: NTIS HC A07/MF A01 CSCL 20/4

An experimental and theoretical program of research was conducted to determine the effect of the main wing wake on the effectiveness of the horizontal tail surface and to further refine and expand the predictive theory initiated during the previous years' effort. Experimentally, it was determined that while the vortex flows developed large pitching moments on the wing, the horizontal tail surface, regardless of its geometrical location with respect to the wing MAC, was able to counter the pitching moment and trim the configuration. The experimental data also indicated that, while large changes in the pitch angle of the horizontal tail were required to obtain configuration trim when the concentrated wing vortex wake was in the vicinity of the horizontal tail surface, the aerodynamic angle of attack remained relatively small and the tail effectiveness did not change by more than 25%. The refined and expanded theoretical prediction method provided greater insight in the aerodynamic characteristics on the upper and lower surface and, in general, predicted the vortex flow effects more accurately. The results suggest that with the proper program streamlining and documentation the predictive program can be used successfully as a design tool.

Author (GRA)

N79-14047# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.

DYNAMIC RESPONSE OF LIFT FANS SUBJECT TO VARIOUS BACKPRESSURE

John M. Durkin and Lawrence H. Luehr Jul. 1978 18 p refs Presented at the AIAA/SNAME Advanced Marine Vehicles Conf., San Diego, Calif., 17-19 Apr. 1978

(AD-A057292; AERO-1253; AIAA-Paper-78-75; DTNSRDC-78/063) Avail: NTIS HC A02/MF A01 CSCL 13/7

An analytical investigation of the dynamic performance of a centrifugal lift fan was conducted to provide an explanation for the behavior which occurred when the fan was subjected to a varying backpressure. Analysis of test data shows that the fan response del Q/del P can be represented by a first-order lag system. An in-depth analysis of the various elements of the lift fan system revealed that the inertia of the air within the fan was the primary contributor to the observed fan behavior. The analysis further showed that variations in fan speed would not produce the behavior measured in the test and that the response due to the compliant properties of air within the fan occurs at a frequency that is much higher than the frequency range of the test. A time-domain digital computer program has been developed which integrates the rate of change of fan flow with a varying backpressure. Good correlation is exhibited between test data and the computer predictions at all frequencies.

Author (GRA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N79-14048*# Douglas Aircraft Co., Inc., Long Beach, Calif.

CARGO LOGISTICS AIRLIFT SYSTEMS STUDY (CLASS). VOLUME 1: ANALYSIS OF CURRENT AIR CARGO SYSTEM

R. J. Burby and W. H. Kuhlman Oct. 1978 580 p refs

(Contract NAS1-14948)

(NASA-CR-158912) Avail: NTIS HC A25/MF A01 CSCL 01C

The material presented in this volume is classified into the following sections; (1) analysis of current routes; (2) air eligibility criteria; (3) current direct support infrastructure; (4) comparative mode analysis; (5) political and economic factors; and (6) future potential market areas. An effort was made to keep the observations and findings relating to the current systems as objective as possible in order not to bias the analysis of future air cargo operations reported in Volume 3 of the CLASS final report. G.Y.

N79-14049*# Douglas Aircraft Co., Inc., Long Beach, Calif.

CARGO LOGISTICS AIRLIFT SYSTEMS STUDY (CLASS). VOLUME 3: CROSS IMPACT BETWEEN THE 1990 MARKET AND THE AIR PHYSICAL DISTRIBUTION SYSTEMS, BOOK 2

R. J. Burby and W. H. Kuhlman Oct. 1978 346 p refs

(Contract NAS1-14948)

(NASA-CR-158914) Avail: NTIS HC A15/MF A01 CSCL 01C

Book 2 of this volume is divided into the following sections: (1) commodities and system networks; (2) future mode choice decisions and commodity air eligibility; (3) comparative cargo transportation costs - air, truck, rail and water; (4) elasticities of demanp; (5) operating cost; (6) operating profit, rate making, and returns; (7) importance of rate and service on future aircraft; (8) potential market demand for new aircraft; (9) scenario of events affecting system/market growth; and (10) future study and technology requirements. G.Y.

N79-14050*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NASA AVIATION SAFETY REPORTING SYSTEM Quarterly Report, 1 Oct. - 31 Dec. 1977

Aug. 1978 61 p refs Prepared in cooperation with Battelle Columbus Labs., Mountain View, Calif.

(NASA-TM-78528; A-7626; QR-7) Avail: NTIS HC A04/MF A01 CSCL 01C

A sample of reports relating to operations during winter weather is presented. Several reports involving problems of judgment and decisionmaking have been selected from the numerous reports representative of this area. Problems related to aeronautical charts are discussed in a number of reports. An analytic study of reports involving potential conflicts in the immediate vicinity of uncontrolled airports was performed; the results are discussed in this report. It was found that in three-fourths of 127 such conflicts, neither pilot, or only one of the pilots, was communicating position and intentions on the appropriate frequency. The importance of providing aural transfer of information, as a backup to the visual see and avoid mode of information transfer is discussed. It was also found that a large fraction of pilots involved in potential conflicts on final approach had executed straight-in approaches, rather than the recommended traffic pattern entries, prior to the conflicts. A selection of alert bulletins and responses to them by various segments of the aviation community is presented. G.G.

N79-14061# Transportation Systems Center, Cambridge, Mass.

SUMMARY OF AIRLINE DELAY TRENDS 1972-1975 Final Report

Helen Condell and Seymour R. Horowitz Oct. 1977 62 p

(AD-A050960; TSC-FAA-77-6-F) Avail: NTIS

HC A04/MF A01 CSCL 01/2

This document is a highlight edition of the Annual Airline Delay Trends Report published since 1974. These reports provide estimates of block, airborne, and ground delays for approximately 325 route segments connecting 20 of the most active U.S. airports, and serviced by 19 major domestic scheduled air carriers. Delay information as presented in this summary edition consists of airborne and ground data for each of the 20 airports in the study, displayed in both table and graph form, for the years 1972 through 1975 for the following categories: (1) Total traffic activity for route segments arriving at each of the 20 airports by 'busy' and 'dull' time interval ('Busy' 7:00 - 22:59, 'Dull' - 23:00 - 06:59); (2) Average airborne delays for route segments arriving at each of the 20 airports, by 'busy' and 'dull' time intervals; and (3) Average ground times and delays for route segments departing and arriving the 20 airports, by 'busy' and 'dull' time intervals. A table showing the monthly average of airborne arrival delays at a summary airport which represents the total of the 20 study airports is also included. Author (GRA)

N79-14062# Control Data Corp., Minneapolis, Minn. Research Div.

GUIDELINES FOR FLIGHT PLANNING DURING PERIODS OF HIGH OZONE OCCURRENCE Final Report

A. D. Belmont, R. W. Wilcox, G. D. Nastrom, D. N. Hovland, and D. G. Dartt 11 Jan. 1978 161 p refs

(Contract DOT-FA77WA-4074)

(AD-A050988) Avail: NTIS HC A08/MF A01 CSCL 04/1

At jet cruising altitudes high ozone amounts sometimes occur in the cabin. The purpose of this report is to present, for airline operational personnel, the best current estimate of the average ambient (outside) ozone and its variability with time and space. These summaries are based on two types of observations: balloon ozonesonde data for stations in Japan, North America, and western Europe; and 'GASP' data from commerical airliners obtained under the Global Atmospheric Sampling Program (GASP) conducted by the National Aeronautics and Space Administration. The relationship of ozone amount with stratospheric transport mechanisms is discussed, leading to the identification of several meteorological parameters which can be used to qualitatively forecast ozone on a daily basis. Also presented is a preliminary regression of ozone with stratospheric temperature, developed from GASP data. Author (GRA)

N79-14063# National Transportation Safety Board, Washington, D. C. Bureau of Technology.

ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA, U.S. AIR CARRIER OPERATIONS, 1977

6 Sep. 1978 90 p

(PB-287423/8; NTSB-ARC-78-2) Avail: NTIS HC A05/MF A01 CSCL 01A

The record of aviation accidents in all operations of the U.S. air carriers for calendar year 1977 are presented. It includes an analysis by class of carrier and type of service in which the 1977 performances were compared with 5-year base-period averages. A 10-year review, 1968 through 1977, of the certificated route carriers is presented for accident rates by aircraft make and model, types of accidents, phases of operation causes or related factors, and a comparison between scheduled and nonscheduled revenue service. Statistical tables which summarize the accidents, fatalities, and accident rates; causal tables; and briefs of accidents are presented in the appendixes. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N79-14064 Aerospace Engineering Test Establishment, Ottawa (Ontario).

SUPPORT FOR TRANSPORT CANADA INERTIAL-REFERENCED FLIGHT INSPECTION SYSTEM FLIGHT TRIALS

D. J. McNair 13 Dec. 1978 30 p refs

(AETE-76/71) Copyright. Avail: Issuing Activity

The Aerospace Engineering Test Establishment (AETE) provided support to Transport Canada during the flight trials of an Inertial-Referenced Flight Inspection System. As part of this support AETE constructed a reference (phantom) runway and provided correlation by phototheodolite at the Primrose Lake Evaluation Range. Author

N79-14065# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.

QUANTIZATION-ERROR MODELING IN AIDED INERTIAL NAVIGATION SYSTEMS

Arie Yavnai and Itzhack Y. Bar-Itzhack Apr. 1977 20 p refs

(TAE-300) Avail: NTIS HC A02/MF A01

A method is presented for introducing the quantization errors of inertial navigation systems into the state space representation of their error model which is needed for Kalman filtering when the system is aided by additional measurements through a mission. It is seen that the quantization errors have to be introduced also into the observation equations and hence, correlate the observation and the error-model white noises which complicates the necessary Kalman filter routine. It is concluded that the quantization errors play a negligible role in the INS error propagation but when the measurements are precise, the quantization errors have a major impact on the accuracy of the aided system through the observation equations. Author

N79-14066# Committee of the Whole House on the State of the Union (U. S. House).

THE MICROWAVE LANDING SYSTEM (MLS) CONTROVERSY

Washington GPO 1978 81 p refs Rept. by Comm. on Government Operations, 85th Congr., 2d Sess., 12 Apr. 1978 (H-Rept-95-1052; GPO-29-006) Avail: US Capitol, House Document Room

The Government Activities and Transportation Subcommittee of the Committee on Government Operations is charged with general oversight jurisdiction for the Federal Aviation Administration (FAA). In pursuit of the assigned oversight objective, the subcommittee conducted an investigation of the FAA's program for the development of a microwave landing system (MLS) and concentrated its investigation on the FAA's efforts to secure approval by the International Civil Aviation Organization (ICAO) of the U.S. MLS candidate, time reference scanning beam (TRSB). The paramount reason for the investigation was that serious charges were raised by entities and representatives of a foreign nation, the Plessey Co., Ltd, of the United Kingdom, about the operations of the FAA in the AWOP/ICAO selection process. G.Y.

N79-14067# Federal Aviation Administration, Washington, D. C. Office of Systems Engineering Management.

FAA BCAS CONCEPT, CONCEPT DESCRIPTION

E. J. Koenke et al Apr. 1978 263 p

(AD-A059535; FAA-EM-78-5-2) Avail: NTIS HC A12/MF A01 CSCL 17/7

A unique airborne aircraft collision avoidance system concept which assures adequate separation from the largest possible percentage of potential collision threats is described. The concept was designed to operate in all airspace as a compatible backup to the present and evolving ATC system, and is acceptable to the pilot and the user community. The system concept is used in the aviation community's large existing investment in ATCRBS transponders and on the ground based beacon surveillance system network for the basic sources of the collision avoidance information. S.E.S.

N79-14068# National Aviation Facilities Experimental Center, Atlantic City, N. J.

A BREADBOARD MODEL USED TO DEMONSTRATE THE FEASIBILITY OF RECORDING NATIONAL AIRSPACE

SYSTEM ENROUTE DISPLAY DATA Final Report, Sep. 1975 - Sep. 1977
Edwin A. Mack, Stephen D. Stratoti, and Lane G. Hinkley Sep. 1978 32 p
(FAA Proj. 122-113-510)
(AD-A059703; FAA-NA-78-32; FAA-RD-78-97) Avail: NTIS HC A03/MF A01 CSCL 01/5

Various techniques for providing the capability of re-creating or replaying on demand air traffic histories for operational or incident analysis was investigated. To demonstrate feasibility, the best technique was selected and a single-thread breadboard model designed and fabricated. It was concluded that the single-channel breadboard model, employing the digital recording technique and utilizing the Display Control Vector Generator input area as the data recording point, adequately demonstrated the feasibility of recording, storing, and reproducing NAS en route air traffic control display data. A full-scale multiple-channel engineering model was designed, fabricated, and evaluated.
S.E.S.

N79-14059# National Aviation Facilities Experimental Center, Atlantic City, N. J.
TESTING THE FEASIBILITY OF DIFFERENTIAL OMEGA FOR AIRBORNE USE Final Report, Jul. 1975 - Sep. 1977
Robert Erikson Aug. 1978 27 p
(FAA Proj. 043-304-500)
(AD-A059329; FAA-NA-78-10; FAA-RD-78-91) Avail: NTIS HC A03/MF A01 CSCL 17/7

The testing conducted at the National Aviation Facilities Experimental Center (NAFEC) in order to determine the critical characteristics of one airborne feasibility model Differential Omega System is presented. Through static testing, dynamic simulation, and actual test flights in the Atlantic City, New Jersey area, Differential Omega was compared to Skywave-corrected and uncorrected Omega. These experiments provided data to determine the operating range, accuracy, the limits of system performance, and an accuracy comparison using three different phase correction techniques. It was found that Differential Omega was the most accurate system with no noticeable decrease in accuracy up to 150 nautical miles. Improvements to the Differential Omega system which may be incorporated into later units to improve their capability were outlined.
S.E.S.

N79-14060# SRI International Corp., Menlo Park, Calif.
POLICY IMPACTS OF ATC AUTOMATION: HUMAN FACTORS CONSIDERATIONS Final Report
G. J. Couluris, M. G. Tashker, and M. C. Penick Jan. 1978 134 p refs Prepared in cooperation with Payne-Maxie Consultants, Berkeley, Calif.
(Contract DOT-FA76WAI-635; SRI Proj. 5719)
(AD-A051064; FAA-AVP-78-1; Payne-Maxie-Consultants-036) Avail: NTIS HC A07/MF A01 CSCL 05/8

This report examines the future policy impact implications of advanced air traffic control (ATC) systems which might be developed by the Federal Aviation Administration (FAA). It studies impacts of ATC automation on sector air traffic controllers, with emphasis placed on the identification of human factors problems that may arise in the future if higher levels of automation are implemented. Of particular concern are those human factors that may in some manner determine the direction of automation development or impede the implementation of automation. Using descriptions of technological components currently proposed by the FAA, six ATC system operations were defined. These systems represent various levels of automation development from the current system to a system in which the human controller acts as a systems data manager. The systems were evaluated in terms of 17 factors describing job satisfaction and motivation, man-machine interface, and failure mode operations in order to identify critical operational characteristics for each system.
GRA

N79-14061# Bendix Corp., Baltimore, Md. Communications Div.
DESIGN, FABRICATION, AND TESTING OF BRASSBOARD MODEL ATCRBS BASED SURFACE TRILATERATION DATA ACQUISITION SUBSYSTEM Final Report, Jun. - Dec. 1975
A. L. Brockway, J. B. Kuhl, and P. J. Woodall Dec. 1977 39 p refs
(Contract DOT-TSC-769)
(AD-A051148; BENDIX-489A10A; FAA-RD-77-174; FAA-77-26) Avail: NTIS HC A03/MF A01 CSCL 17/7

Field-test results are emphasized in this report which also contains background information on airport surface traffic control (ASTC) and the contract objectives. The field-test series proved the technical feasibility of an air traffic control radar beacon system (ATCRBS) based ASTC sensor system. Operational data acquisition subsystem (DAS) performance projections developed to date as a result of the test series are presented, and a recommendation for pursuit of further testing is substantiated.
Author (GRA)

N79-14062# Transportation Systems Center, Cambridge, Mass.
PERFORMANCE PREDICTIONS FOR PROPOSED ILS FACILITIES AT SAINT LOUIS MUNICIPAL AIRPORT Final Report, May 1975 - Jun. 1977
L. Jordan, S. Morin, R. Stone, and J. Hull Jan. 1978 36 p refs
(AD-A051513; TSC-FAA-77-22; FAA-RD-78-1) Avail: NTIS HC A03/MF A01 CSCL 17/7

The results of computer simulations of performance of proposed ILS facilities on Runway 12L/30R at St. Louis Municipal Airport (Lambert Field) are reported. These simulations indicate that an existing industrial complex located near the runway is compatible with acceptable performance of the proposed facilities. Strict adherence to FAA standards for site grading is suggested to insure satisfactory performance of the glide slope systems.
Author (GRA)

N79-14063# Transportation Systems Center, Cambridge, Mass.
BEACON COLLISION AVOIDANCE SYSTEM (BCAS) AIRBORNE ANTENNA DIVERSITY STUDY Final Report, Jun. - Nov. 1977
John H. Kraemer Apr. 1978 156 p refs
(AD-A054976; TSC-FAA-78-3; FAA-RD-78-2) Avail: NTIS HC A08/MF A01 CSCL 17/7

The potential need for antenna diversity on the intruding aircraft was examined. The BCAS system was used for determining airborne antenna diversity requirements for general aviation aircraft approaching a BCAS equipped aircraft from various angles. The BCAS system was operated in the forced active plus passive mode. Air Traffic Control Radar Beacon System (ATCRBS) replies to the BCAS interrogator (forced active mode) and to a secondary surveillance radar, SSR (passive mode), were recorded and used as a measure of the adequacy of the air-to-air and ground-to-air radio links for some selected critical situations. The intruding general aviation aircraft was equipped with top- and bottom-mounted ATCRBS antennas (with independent transponders) during one series of encounters. The second series of encounters was flown with an aircraft equipped with a single bottom-mounted transponder antenna.
Author (GRA)

N79-14064# Transportation Systems Center, Cambridge, Mass.
EXPERIMENTAL BCAS PERFORMANCE RESULTS Interim Report, Apr. 1975 - May 1978
Janis Vilcans, Edward Quish, Juris G. Raudseps, Herbert Glynn, and Benjamin S. Goldstein Jul. 1978 416 p refs
(AD-A058936; TSC-FAA-78-9; FAA-RD-78-53) Avail: NTIS HC A18/MF A01 CSCL 01/4

The results of the (Litchford) Beacon-based Collision Avoidance System concept feasibility evaluation are reported. Included are a description of the concept, analysis and flight test results. The system concept is based on the range and bearing measurements for detecting and resolving a threat. The experimental hardware, developed under Contract No. DOT-TSC-1103, Task 1-8, did not implement the automatic radar selection and lock-on mode and the capability to compute target range and bearing in real time which the concept requires. These enhancements are currently being implemented. All three generic modes of the BCAS were evaluated. These are: the passive (listen-in), the active (interrogate by on-board transmitter), and the combined (active-passive). Also, reported are results of the comprehensive in-house study effort conducted on the azimuth signal requirements and on single-site feasibility. It is concluded that the BCAS is a technically feasible concept and that the passive mode with an azimuth reference signal would be more

accurate and less troublesome than other BCAS alternatives. For each operating mode there are geometries in which system performance fails or is degraded to some degree. System reliability may therefore require the implementation of various operating modes. Author (GRA)

N79-14065# Bendix Corp., Baltimore, Md. Communications Div.
DESIGN, FABRICATION, AND TESTING OF A BRASSBOARD MODEL ATCRBS BASED SURFACE TRILATERATION DATA ACQUISITION SUBSYSTEM Final Report, Jun. - Dec. 1977
A. L. Brockway, J. B. Kuhl, and P. J. Woodall Jun. 1978 180 p refs
(Contract DOT-TSC-769)
(AD-A057933; BENDIX-489A09A; DOT-TSC-FAA-78-7; FAA-RD-78-63) Avail: NTIS HC A09/MF A01 CSCL 17/7

Field test results are emphasized in this report, which also contains background information on Airport Surface Traffic Control (ASTC) and the contract objectives. The National Aviation Facilities Experimental Center (NAFEC) field test series conclusively proved the technical feasibility of an Air Traffic Control Radar Beacon System (ATCRBS) based Airport Surface Traffic Control sensor system. Operational Data Acquisition Subsystem (DAS) performance projections developed to date as a result of the National Aviation Facilities Experimental Center test series are presented, and a recommendation for pursuit of Contract Option 2 is substantiated. Author (GRA)

N79-14066# Transportation Systems Center, Cambridge, Mass.
SYSTEMS INTEGRATION ANALYSIS FOR FUTURE TOWER CAB CONFIGURATIONS/SYSTEMS Interim Report, Jul. - Oct. 1977
V. J. Hobbs, D. F. Clapp, P. Rempfer, L. E. Stevenson, and D. Devoe Jun. 1978 310 p Continuation of Rept. FAA-EM-77-10, DOT-TSC-FAA-77-19, FAA-EM-77-16, DOT-TSC-FAA-78-2 (AD-A059006; TSC-FAA-78-6; FAA-EM-77-10; DOT-TSC-FAA-77-19; FAA-EM-77-16; DOT-TSC-FAA-78-2) Avail: NTIS HC A14/MF A01 CSCL 17/7

This report presents the results of the analysis of various aspects of the integration of future ATC systems into the tower cab. The impact on the tower cab environment is analyzed from several points of view: how the systems information and displays might be used to approach idealized controller station configurations; how the cab equipment and displays resulting from these systems might be fitted into existing controller station configurations; how those systems--some not yet fully defined--might evolve and interact with the present and future systems; how the data-processing functions and equipment might be integrated; and how, or if, economies might be achieved through common siting of certain system sensors. GRA

N79-14067# Systems Control, Inc., Palo Alto, Calif.
ECONOMIC REQUIREMENTS ANALYSIS OF CIVIL AIR NAVIGATION ALTERNATIVES, VOLUME 1 Final Report
H. L. Solomon Apr. 1978 96 p refs
(Contract DOT-FA75WA-3662)
(AD-A058272; FAA-ASP-78-3-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 14/1

This report summarizes a study whose objectives were to: Develop a life cycle cost computer model to evaluate various alternative civil aviation navigation systems; Project government implementation and recurring costs and user avionics costs associated with each alternative; Develop rational implementation/transition scenarios for various combinations of the systems to provide civil air navigation coverage in the CONUS, Alaska, Oceanic and Off-shore regions; and Make an initial assessment of the economic impact upon the FAA and civil aviation users for each scenario. Alternatives evaluated were VOR/DME, Loran-C, Omega, Differential Omega, and GPS. The least costly alternative, based upon combined civil user and FAA costs, was found to be continued use of VOR/DME. Sole use of GPS was found to be the most costly alternative. GRA

N79-14068# Arinc Research Corp., Annapolis, Md.
USER DELAY COST MODEL AND FACILITIES MAINTENANCE COST MODEL FOR A TERMINAL CONTROL AREA. VOLUME 1: MODEL FORMULATION AND DEMONSTRATION Final Report, Mar. - Sep. 1976
L. B. Greene, J. Witt, and M. Sternberg-Powidzki May 1978 126 p refs
(Contract DOT-TSC-1173-1)
(AD-A059007; FAA-AAF-220-78-01-1-Vol-1; TSC-FAA-78-1.1-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 01/5

The User Delay Cost Model (UDCM) is a Monte Carlo computer simulation of essential aspects of Terminal Control Area (TCA) air traffic movements that would be affected by facility outages. The model can also evaluate delay effects due to other factors, such as weather, aircraft schedule intensity, and approach minima. Although the Boston TCA was selected as the study vehicle for development and demonstration, the model is structured so that it can be applied to other TCAs. The Facility Maintenance Cost Model (FMCM) is designed to evaluate the expected annual labor cost of maintaining FAA facilities within a maintenance sector. The model was developed for time-share computer application and can evaluate both the preventive maintenance and corrective maintenance required by any single facility (e.g., a visual omni-range or VOR), accumulate staffing and cost data on similar facilities (e.g., all VORs) within the specified maintenance sector, and then evaluate all other types of facilities (e.g., Airport Surveillance Radar, Outer Markers) within the sector. This is the first of three volumes. Volume 2 is a user's manual for the user delay cost model. Volume 3 is a user's manual for the facilities maintenance cost model. Author (GRA)

N79-14069# Arinc Research Corp., Annapolis, Md.
USER DELAY COST MODEL AND FACILITIES MAINTENANCE COST MODEL FOR A TERMINAL CONTROL AREA. VOLUME 2: USER'S MANUAL AND PROGRAM DOCUMENTATION FOR THE USER DELAY COST MODEL Final Report, May - Sep. 1976
L. B. Greene, J. Witt, and M. Sternberg-Powidzki May 1978 194 p refs
(Contract DOT-TSC-1173-2)
(AD-A058984; AAF-220-78-01-2-Vol-2; TSC-FAA-78-1.2-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 01/5

The User Delay Cost Model (UDCM) is a Monte Carlo simulation of certain classes of movement of air traffic in the Boston Terminal Control Area (TCA). It incorporates a weather module, an aircraft generation module, a facilities module, and an air control module to simulate delays, resulting from facility outage, imposed on four user classes: Air Carrier, Air Taxi, General Aviation, and Military Aircraft. The model can also be used to measure delays due to changing aircraft arrival rates, weather and other environmental considerations, approach types available, or any other factor that affects trail separation in final approach of the maximum number of aircraft an air controller can handle. This is the second of three volumes. Volume 1 documented the model formulation and demonstration. Volume 3 is a user's manual and program documentation for the facilities maintenance cost model. Author (GRA)

N79-14070# Arinc Research Corp., Annapolis, Md.
USER DELAY COST MODEL AND FACILITIES MAINTENANCE COST MODEL FOR A TERMINAL CONTROL AREA. VOLUME 3: USER'S MANUAL AND PROGRAM DOCUMENTATION FOR THE FACILITIES MAINTENANCE COST MODEL Final Report, Mar. 1976 - Sep. 1976
L. B. Greene, J. Witt, and M. Sternberg-Powidzki May 1978 49 p
(Contract DOT-TSC-1173-3)
(AD-A059008; FAA-AFF-220-78-01-3-Vol-3; TSC-FAA-78-1.3) Avail: NTIS HC A03/MF A01 CSCL 01/5

The Facilities Maintenance Cost Model (FMCM) is an analytic model designed to calculate expected annual labor costs of maintenance within a given FAA maintenance sector. The model is programmed in FORTRAN IV and has been demonstrated on the CDC Kronos time-sharing system. Model inputs are facility identification data, maintenance support scenarios, and facility reliability and maintainability data. The principal model outputs include the expected annual direct labor and salary costs of maintaining a specific facility type within a sector, the required number of personnel by skill level for that facility type, the costs

of preventive maintenance and corrective maintenance, and the costs of call-backs. The model also provides total cost and labor data on all of the facilities within the sector. This is the third of three volumes. Volume 1 documents the model formulation and demonstration. Volume 3 is a user's manual and contains the program documentation for the user delay cost model.
Author (GRA)

N79-14071# Stanford Research Inst., Menlo Park, Calif.
ATLANTA CENTER UPGRADED THIRD GENERATION ENROUTE ATC SYSTEM OPERATIONS: A CASE STUDY Final Report
George J. Couluris, Jerome M. Johnson, and H. Steven Procter Mar. 1977 156 p refs
(Contract DOT-FA75WA-3714)
(AD-A056180; FAA-AVP-77-22) Avail: NTIS HC A08/MF A01 CSCL 17/7

This report documents the work performed to assess the impact of Upgraded Third Generation Enroute Air Traffic Control (ATC) System alternatives on control facility operations. The various enhancement features are considered to be added incrementally to the current National Airspace System (NAS) Stage A enroute ATC operation and include: automatic data handling, enroute metering, automated local flow control, conflict probe, area navigation, Discrete Address Beacon System (DABS) data link, and DABS-based intermittent positive control. Staffing estimates for each enhancement system are made for the Atlantic Air Route Traffic Control Center for the years 1980 through 2000, and include Air Traffic Service and Airway Facilities Service personnel. The estimation procedure uses models previously developed by SRI based on extensive observations of ATC operations. These models include the Relative Capacity Estimating Process (RECEP), which relates ATC sector controller workload requirements to traffic capacities, and the Air Traffic Flow (ATF) network simulation model, which assesses traffic capacity and delay in a multisector environment. GRA

N79-14072# Systems Control, Inc., Palo Alto, Calif.
ECONOMIC REQUIREMENTS ANALYSIS OF CIVIL AIR NAVIGATION ALTERNATIVES, VOLUME 2 Final Report
H. L. Solomon Apr. 1978 396 p refs
(Contract DOT-FA75WA-3662)
(AD-A058228; FAA-ASP-78-3-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 14/1

This report summarizes a study whose objectives were to: Develop a life cycle cost computer model to evaluate various alternative civil aviation navigation systems; Project government implementation and recurring costs and user avionics costs associated with each alternative; Develop rational implementation/transition scenarios for various combinations of the systems to provide civil air navigation coverage in the CONUS, Alaska, Oceanic and Offshore regions and; Make an initial assessment of the economic impact upon the VOR/ DME, Loran-C, Omega, Differential Omega, and GPS. The least costly alternative, based upon combined civil user and FAA costs, was found to be continued use of VOR/DME. Sole use of GPS was found to be the most costly alternative. GRA

N79-14073# Federal Aviation Administration, Washington, D. C.
NATIONAL PLAN FOR DEVELOPMENT OF THE MICROWAVE LANDING SYSTEM, JUNE 1978 UPDATE
Jun. 1978 98 p refs
(AD-A058548; FAA-ED-07-2A) Avail: NTIS HC A05/MF A01 CSCL 17/7

An updated plan for the development of an interoperable civil/military microwave landing system (MLS) is presented. The original plan delineated a five (5) year program of integrated activity deemed necessary to provide a MLS that meets the wide range of user operational requirements. The substance of the work and the goals achieved under the initial plan have occurred essentially as planned except for the schedule. The TRSB (Time Reference Scanning Beam) technique selection was made about one year later than originally planned and considerable time and resources were devoted to ICAO activities that were not initially envisioned. A major milestone in the MLS program was achieved in April 1978 at the All Weather Operations Divisional meeting of ICAO, when the U.S. TRSB system was selected to be the standard system for international civil use as a replacement for ILS. GRA

N79-14074# Honeywell, Inc., St. Petersburg, Fla. Avionics Div.
GEO-SPIN (TRADEMARK) PRECISION INERTIAL SURVEY
Richard H. Roller, Jr. Apr. 1978 454 p refs
(Contract DAAK70-77-C-0070)
(AD-A059435; ETL-0135) Avail: NTIS HC A19/MF A01 CSCL 08/5

A surveying feasibility system was assembled using a modified Honeywell GEANS Airborne Navigation System utilizing Electrostatically suspended gyros. The system utilized a conventional mini-computer and was mounted in a truck. The unit was then used to survey at St. Petersburg, Florida and at White Sands, New Mexico. This test program showed performance of one meter with the identification of several error sources in the software area, which when incorporated should reduce the errors to less than 0.1 meters. Author (GRA)

N79-14075# Naval Air Engineering Center, Lakehurst, N.J. Engineering Dept.
FRESNEL LENS OPTICAL LANDING SYSTEM MK6 MOD 3 STABILIZATION CIRCUIT BOARD TEST SPECIFICATIONS Final Technical Report
W. F. Davis 19 Sep. 1978 125 p
(AD-A059786; NAEC-9-7917) Avail: NTIS HC A06/MF A01 CSCL 09/1

This is a test procedure for the printed circuit boards in the stabilization section of the Fresnel Lens Optical Landing System, MK 6 Mod 3. The tests are intended to be only functional screening tests for the assembled boards. The tests do not provide burn-in nor accelerated life tests for individual components.
Author (GRA)

N79-14076# Arinc Research Corp., Annapolis, Md.
RELIABILITY IMPROVEMENT WARRANTY (RIW) SUPPORT FOR THE LIGHTWEIGHT DOPPLER NAVIGATION SYSTEM (LDNS) PROGRAM Final Report, Sep. 1977 - Sep. 1978
A. Bilodeau and P. Dallosta Sep. 1978 16 p
(Contract F04606-76-A-0087)
(AD-A059970; Rept-1956-01-1-1804) Avail: NTIS HC A02/MF A01 CSCL 17/7

The Lightweight Doppler Navigation System (LDNS) Program is under the management of the U.S. Army Navigation/Control (NAVCON) Systems Project Office at Fort Monmouth, New Jersey. In December 1976, Singer Company-Kearfott Division was awarded the initial production contract that included the Reliability Improvement Warranty (RIW) terms and provisions. Prior to this contract effort, ARINC Research Corporation assisted the NAVCON Project Office during the Engineering Development (ED) phase of the LDNS Program and participated in the development of RIW terms and conditions of the Initial Production (IP) solicitation. Under the current contract effort, ARINC Research provided engineering assistance in defining the Defense Contract Administration Services Office (DCASO) and the manufacturer's warranty responsibilities, in reviewing the contractor warranty data collection plan, and in developing LDNS field implementation plans. This report presents the results of these activities. Author (GRA)

N79-14077# Naval Air Rework Facility, Norfolk, Va.
EVALUATION OF A COMMERCIAL OMEGA NAVIGATION SYSTEM INSTALLED IN THE C-118 AIRCRAFT
Clifton G. Wrestler, Jr. 26 Sep. 1978 23 p refs
(AD-A060154; NARF-C-118-WSM-1-78) Avail: NTIS HC A02/MF A01 CSCL 17/7

A Commercial OMEGA Navigation System (ONS) Litton LTN 201, was flight tested to determine the suitability of the system to meet the commercial specifications and the Navy's long-range overwater navigation requirements for the C-118 aircraft. The ONS on the C-118 aircraft had a position error of less than 1 nautical mile (commercial spec error no greater than 7 nautical miles) for the three areas of operation, CONUS, Caribbean and Mediterranean. Signal to noise ratio readings indicate six stations were available for navigation at all times. Seven stations are the maximum number of stations which can be used for navigation due to algorithms in the LTN 201. In

the Mediterranean area, seven stations were available for navigation in 85% of the samples taken. No point estimates can be made on the reliability of the ONS. With approximately 150 flight hours, there were no failures. A Commercial OMEGA Navigation System will satisfy the long-range overwater navigation requirement in the Atlantic, Caribbean, and Mediterranean for the C-118 aircraft. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N79-14078# Royal Aircraft Establishment, Farnborough (England).

ON THE LIMITS OF STEEP HELICOPTER APPROACHES

M. Rade Apr. 1978 19 p refs Transl. into ENGLISH of "Ueber die grenzen von steilanfluegen mit drehflueglern", Rept. MBB-UD-101-73, May 1973

(RAE-Lib-Trans-1960; BR65223) Avail: NTIS HC A02/MF A01

The flight conditions and limitations influencing steep helicopter approaches are described, the limits for steep instrument approaches stated, and actual flight results are indicated. An approach angle of 15 degrees shows considerable advantages over a normal ILS approach. A few essential conditions for steep instrument approaches are briefly introduced. Author

N79-14079*# Hughes Helicopters, Culver City, Calif.

APPLICATION OF HIGHER HARMONIC BLADE FEATHERING FOR HELICOPTER VIBRATION REDUCTION

Richard W. Powers Apr. 1978 39 p refs

(Contract NAS1-14552)

(NASA-CR-158985) Avail: NTIS HC A03/MF A01 CSCL 01C

Higher harmonic blade feathering for helicopter vibration reduction is considered. Recent wind tunnel tests confirmed the effectiveness of higher harmonic control in reducing articulated rotor vibratory hub loads. Several predictive analyses developed in support of the NASA program were shown to be capable of calculating single harmonic control inputs required to minimize a single 4P hub response. In addition, a multiple-input, multiple-output harmonic control predictive analysis was developed. All techniques developed thus far obtain a solution by extracting empirical transfer functions from sampled data. Algorithm data sampling and processing requirements are minimal to encourage adaptive control system application of such techniques in a flight environment. G.G.

N79-14080*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STRUCTURAL CONCEPTS AND EXPERIMENTAL CONSIDERATIONS FOR A VERSATILE HIGH-SPEED RESEARCH AIRPLANE

L. Robert Jackson, F. S. Kirkham, and J. P. Weidner Nov. 1978 90 p refs

(NASA-TM-78743) Avail: NTIS HC A05/MF A01 CSCL 01C

Future aircraft may be hydrogen fueled and fly at hypersonic speeds. The resulting environments will require new structural concepts to satisfy performance goals. Large representative structures will have to be flight tested prior to commitment to a costly vehicle fleet. To perform flight tests, a versatile, economical, high-speed research airplane is defined. Results of this study including experimental considerations for a hypersonic research airplane are reported. Author

N79-14081*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

IMPROVEMENTS TO THE FATOLA COMPUTER PROGRAM INCLUDING NOSEWHEEL STEERING: SUPPLEMENTAL INSTRUCTION MANUAL

Huey D. Carden and John R. McGehee Dec. 1978 64 p refs

(NASA-TM-78768; L-12295) Avail: NTIS HC A04/MF A01 CSCL 01C

Modifications to a multidegree of freedom flexible aircraft take-off and landing analysis (FATOLA) computer program, which improved its simulation capabilities, are discussed, and supplemental instructions for use of the program are included. Sample analytical results which illustrate the capabilities of an added nosewheel steering option indicate consistent behavior of the airplane tracking, attitude, motions, and loads for the landing cases and steering situations which were investigated. Author

N79-14082*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EFFECTS OF VISUAL AND MOTION SIMULATION CUEING SYSTEMS ON PILOT PERFORMANCE DURING TAKEOFFS WITH ENGINE FAILURES

Benton L. Parris and Anthony M. Cook Dec. 1978 85 p

(NASA-TP-1365; A-7352) Avail: NTIS HC A05/MF A01 CSCL 05H

Data are presented that show the effects of visual and motion during cueing on pilot performance during takeoffs with engine failures. Four groups of USAF pilots flew a simulated KC-135 using four different cueing systems. The most basic of these systems was of the instrument-only type. Visual scene simulation and/or motion simulation was added to produce the other systems. Learning curves, mean performance, and subjective data are examined. The results show that the addition of visual cueing results in significant improvement in pilot performance, but the combined use of visual and motion cueing results in far better performance. Author

N79-14083*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DEVELOPMENT AND VALIDATION OF A PILOTED SIMULATION OF A HELICOPTER AND EXTERNAL SLING LOAD

J. D. Shaughnessy, Thomas N. Deaux (Sperry Support Services, Hampton, Va.), and Kenneth R. Yenni Jan. 1979 113 p refs

(NASA-TP-1285; L-11925) Avail: NTIS HC A06/MF A01 CSCL 01C

A generalized, real time, piloted, visual simulation of a single rotor helicopter, suspension system, and external load is described and validated for the full flight envelope of the U.S. Army CH-54 helicopter and cargo container as an example. The mathematical model described uses modified nonlinear classical rotor theory for both the main rotor and tail rotor, nonlinear fuselage aerodynamics, an elastic suspension system, nonlinear load aerodynamics, and a loadground contact model. The implementation of the mathematical model on a large digital computing system is described, and validation of the simulation is discussed. The mathematical model is validated by comparing measured flight data with simulated data, by comparing linearized system matrices, eigenvalues, and eigenvectors with manufacturers' data, and by the subjective comparison of handling characteristics by experienced pilots. A visual landing display system for use in simulation which generates the pilot's forward looking real world display was examined and a special head up, down looking load/landing zone display is described. Author

N79-14084# Lockheed-California Co., Burbank.

NATURAL ICING FLIGHT TESTS AND ADDITIONAL SIMULATED ICING TESTS OF A UH-1H HELICOPTER INCORPORATING AN ELECTROTHERMAL ICE PROTECTION SYSTEM Final Report, 17 Feb. - 15 Apr. 1977

Richard H. Cotton Jul. 1978 205 p refs

(Contract DAAJ02-77-C-0002; DA Proj. 1H2-63209-D-103) (AD-A059704; LR-28240; USAAMRDL-TR-77-36) Avail: NTIS HC A10/MF A01 CSCL 01/3

Natural icing flights and additional simulated icing tests were accomplished with a UH-1H helicopter equipped with an advanced ice protection system. This testing was the third icing test program accomplished with the test aircraft, but the first to include natural icing conditions. The simulated icing tests were conducted in the National Research Council (NRC) spray rig at Ottawa, Canada. The natural icing flights were made from the Ottawa International Airport. Seven tests in the spray rig and ten natural icing flights were made totaling 30.4 flight hours of icing testing. Icing was encountered on five of the natural icing flights. The icing conditions ranged from 9.15 gram per cubic meter liquid water content at -18 C to 0.30 grams per cubic meter at -2 C. The aircraft

operated in icing conditions on each of the flights from 40 minutes to a little over one hour. The number of main blade de-icing cycles required under the conditions experienced varied from three to five. GRA

N79-14085# Kaman Aerospace Corp., Bloomfield, Conn.
DESIGN, FABRICATION AND LABORATORY TESTING OF A HELICOPTER COMPOSITE MAIN ROTOR HUB Final Report
Robert J. Mayerjak Aug. 1978 214 p refs
(Contract DAAJ02-75-C-0013; DA Proj. 1F2-62209-AH-76)
(AD-A060313; USARTL-TR-78-16) Avail: NTIS HC A10/MF A01 CSCL 01/3

A new graphite-epoxy rotor hub was designed for the CH- 54B helicopter, and a 1/2 scale structural model was fabricated. The hub consisted of three composite plates, which cooperated well to provide efficient load paths. The composite plates were simple and readily fabricated. As a result, the new hub promises improvements in cost, weight, damage tolerance, radar detectability, and maintainability when compared to conventional metal hubs. GRA

N79-14086# Boeing Commercial Airplane Co., Seattle, Wash.
REPAIR OF BONDED PRIMARY STRUCTURE Final Report, Sep. 1976 - May 1978
J. E. McCarty, R. E. Horton, M. C. Locke, R. Z. Mayberry, and M. L. Satterthwait Jun. 1978 119 p
(Contract F33615-76-C-3137)
(AD-A059945; AFFDL-TR-78-79) Avail: NTIS HC A06/MF A01 CSCL 11/1

This report describes a program to develop durable, cost-effective repair methods for adhesive bonded primary structure. Tasks included the evaluation and selection of adhesive systems, the design, analysis and demonstration of repair methods and the performance of cost and flow time studies. Facilities and equipment required at the repair depots to accomplish these repairs were identified. Author (GRA)

N79-14087# Naval Postgraduate School, Monterey, Calif.
COMPUTERIZATION OF TACTICAL AIRCRAFT PERFORMANCE DATA FOR FLEET APPLICATION M.S. Thesis
William Morris Siegel Jun. 1978 53 p refs
(AD-A059912) Avail: NTIS HC A04/MF A01 CSCL 15/7

The nature of operations, variety of missions and configurations, and requirement for rapid response of fleet tactical aircraft has given rise to a unique problem within the Naval Aviation community, this being the interface between the aircrews and the aircraft performance prediction information supplied via charts and data in the Naval Air Training and Operating Procedures Standardization (NATOPS) Manuals. The data presented are not optimally used due to the method of presentation and the time and effort required to extract useful predictions. This investigation addressed the problem by developing a suitable method of NATOPS curve presentation that has sufficient simplicity and accuracy for application to current compact computers. The procedure is defined and numerical algorithms produced which demonstrate the feasibility and desirability of this type of implementation. Author (GRA)

N79-14088# Civil Aviation Administration, London (England).
DYNAMIC RESPONSE OF AIRCRAFT TO UNLOADED AND LOADED PAVEMENT PROFILES Final Report
William H. Highter and Mark R. Snyder Aug. 1978 63 p refs Revised
(Contract DOT-FA73WAI-361)
(AD-A059787; CEEDO-TR-77-42; FAA-RD-77-160) Avail: NTIS HC A04/MF A01 CSCL 01/3

The objective of this study was to determine whether or not there exists a significant difference in the simulated dynamic response of an F-4C aircraft traversing either an unloaded (undeflected) or loaded (deflected) pavement profile. The Air Force computer code, TAXI, was adapted for use on the Clarkson College IBM 360 Model 65 computer from the CDC 6600 computer used by the Air Force Civil En-ineering Center. The TAXI code calculates the vertical accelerations at three points on an aircraft traversing a pavement profile. It appears that there is no significant difference in the response of TAXI to unloaded and loaded pavement profiles at speeds up to 133.3 feet per second. At higher speeds some rejections of the mean do occur, but in light of the continuous acceptance of the test of the distribution and the predominant acceptance of the test of the mean, these are felt to be insignificant. It appears that the present practice of using unloaded pavement profiles for aircraft dynamic response simulation is acceptable and loaded pavement profiles need not be obtained for this purpose.
Author (GRA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N79-14089# Naval Postgraduate School, Monterey, Calif.
ACQUISITION PLANNING FOR TACTICAL AVIONICS SYSTEMS M.S. Thesis
Cleveland Duane Englehardt Jun. 1978 63 p refs
(AD-A059600) Avail: NTIS HC A04/MF A01 CSCL 09/2

This thesis examines the use of microcomputer technology in tactical avionics systems and its impact on the procurement process of associated hardware and software. The rapid expansion of implementation of large scale integrated circuits in avionics systems aboard tactical military aircraft and missile systems has resulted in some serious potential problems in the areas of development, maintenance and acquisition of microprocessor-based systems and software. These problems are identified and discussed, and proposed recommendations are made to lessen their undesirable long-range effects. Author (GRA)

N79-14090# Illinois Univ. at Urbana-Champaign, Urbana. Decision and Control Lab.
CONTROL STRATEGIES FOR COMPLEX SYSTEMS FOR USE IN AEROSPACE AVIONICS Final Report, 30 Jun. 1973 - 29 Jun. 1978
Jose B. Cruz, Jr. 4 Aug. 1978 22 p refs
(Grant AF-AFOSR-2570-73)
(AD-A059492; DC-17; T-63; AFOSR-78-1258TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

The research program was focused on investigating new methods of analysis, synthesis, and optimization of control systems particularly those which contain uncertain parameters and disturbance inputs. The objective was to develop methods to improve the performance of control systems by counteracting the effects of these random parameters and disturbance inputs. Several new methods which contribute to this objective were proposed and developed under this program. Among these new approaches are strategies for sensitivity adaptive feedback with estimation redistribution, sensitivity reducing compensators using observers, stochastic adaptive control of systems containing random parameters, control of singularly perturbed stochastic systems, trajectory optimization of singularly perturbed systems, time scale decomposition in regulator design, and high gain feedback systems and variable structure systems. The results obtained during the five year period are fully documented in 38 journal articles, 30 conference papers presented at various international congresses and national meetings, and 18 technical reports of the Laboratory. Some of these results were briefly summarized in four Interim Scientific Reports submitted annually during the grant period. Author (GRA)

N79-14091# Westinghouse Electric Corp., Hunt Valley, Md.
THE AVIONICS LABORATORY PREDICTIVE OPERATIONS AND SUPPORT (ALPOS) COST MODEL, VOLUME 3 Final Report, Jun. 1977 - Mar. 1978
John P. Turek, E. Louis Wienecke, III, and Erasmus E. Feltus Apr. 1978 39 p
(Contract F33615-77-C-1105)
(AD-A059354; AFAL-TR-78-49-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 15/5

Recent DOD experience shows that a prime factor in the evaluation of alternative weapon systems for performing a particular mission is Life Cycle Cost (LCC). Since 70% of the system LCC is determined by the end of the conceptual phase,

it is important that techniques to predict LCC be available during that phase. Since system definition is not complete enough in this phase to perform detailed analysis using accounting models, the major tool which can be used is parametric estimating models. This report describes a model which relates the available design parameters to LCC via various cost estimating relationships (CERs). This document is Volume 3 of the Final Report which describes the consolidated data base utilized to develop the Avionics Laboratory Predictive Operations and Support (ALPOS) cost model. The Air Force Program Monitor was Lt. Thomas T. James, Jr. (AFAL/AAA-3), System Evaluation Group, Avionic Systems Engineering Branch. Author (GRA)

N79-14092# Cobro Corp., Silver Spring, Md.
EVALUATION OF AIRCRAFT EQUIPMENT MONITORING DEVICES, PROCEDURES, AND TECHNIQUES Final Report
James E. Marsh Jul. 1978 109 p refs
(Contract DAAJ02-77-C-0052; DA Proj. 1L2-62209-AH-76)
(AD-A059846; USARTL-TR-78-31; TR-11-3) Avail: NTIS HC A06/MF A01 CSCL 01/3

This report presents the results of a study of current diagnostic techniques and procedures used at the aviation unit maintenance level for Army helicopters. A projection is provided to show the potential improvement which could be attained in reliability (R), availability (A), and direct support costs (C) for selected helicopter components through improved diagnostic methods. This potential would be realized if the current field diagnostic capability were improved to the effectiveness represented by the engineering teardown underlying the Disassembly and Inspection Reports (DIRs). The validity of current diagnostic monitoring devices, techniques and procedures is presented in terms of comparison of the unit removal reason to the actual DIR finding upon teardown. A relationship of primary fault indicators to the degree of aircraft damage or loss of mission effectiveness is also presented.
Author (GRA)

N79-14093# General Electric Co., Utica, N. Y. Aircraft Equipment Div.
MODULAR AVIONICS PACKAGING (MAP) Final Report
30 Nov. 1977 243 p refs
(Contract N00163-77-C-0295)
(AD-A059637) Avail: NTIS HC A11/MF A01 CSCL 09/5

In considering Modular Avionics Packaging, the objective of the General Electric study program was to develop an avionics equipment packaging concept, compatible with MIL-E-5400, and applicable to multiplatform avionics requirements stretching into the 1990's. Specific elements evaluated were: Standard Avionics Module (SAM) requirements and concepts; integrated racks and WRA requirements and concepts; and airframe interface considerations. The V/STOL Type A platform was used as the driving requirement in performing trade-off studies. Key design objectives and constraints included the following: Minimizing installed avionics weight and volume; Mechanical simplicity; Significant improvement in Reliability and Maintainability; Eliminating single-point failure modes; Direct access to Weapons Replaceable Modules (WRM); Modules capable of being conduction-cooled; Significant improvement in thermal performance; and Improved testability at all hardware levels. GRA

N79-14094# Westinghouse Electric Corp., Hunt Valley, Md.
THE AVIONICS LABORATORY PREDICTIVE OPERATIONS AND SUPPORT (ALPOS) COST MODEL, VOLUME 2 Final Report, Jun. 1977 - Mar. 1978
Erasmus E. Feltus Wright-Patterson AFB, Ohio AFAL Apr. 1978 159 p refs
(Contract F33615-77-C-1105; AF Proj. 2003)
(AD-A059516; AFAL-TR-78-49-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 15/5

Recent DOD experience shows that a prime factor in the evaluation of alternative weapon systems for performing a particular mission is Life Cycle Cost (LCC). Since 70% of the system LCC is determined by the end of the conceptual phase, it is important that techniques to predict LCC be available during the phase. Since system definition is not complete enough in this phase to perform detailed analysis using accounting models, the major tool which can be used is parametric estimating models. This report describes a model which relates the available design parameters to LCC via various cost estimating relationships (CERs). This document is Volume II of the Final Report which describes the mathematical and statistical techniques used to obtain the cost estimating relationships and parametric estimating relationships needed to develop the Avionic Laboratory Predictive Operations and Support (ALPOS) Cost Model. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N79-14095* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CAM-OPERATED PITCH-CHANGE APPARATUS Patent
Philip E. Barnes, inventor (to NASA) (United Technologies Corp., Windsor Locks, Conn.) Issued 7 Nov. 1978 8 p Filed 9 Oct. 1974 Published under the second Trial Voluntary Protest Program as B 513, 346, 9 Mar. 1976 Sponsored by NASA
(NASA-Case-LEW-13050-1; US-Patent-4,124,330;
US-Patent-Appl-SN-513346; US-Patent-Class-416-157B;
US-Patent-Class-416-162; US-Patent-Class-416-160;
US-Patent-Class-416-167) Avail: US Patent and Trademark Office CSCL 01C

A pitch-change apparatus for a ducted thrust fan having a plurality of variable pitch blades employs a camming ring mounted coaxially at the hub at an axially fixed station along the hub axis for rotation about the hub axis both with the blades and relative to the blades. The ring has a generally spherical outer periphery and a plurality of helical camming grooves extending in a generally spherical plane on the periphery. Each of the variable pitch blades is connected to a pitch-change horn having a cam follower mounted on its outer end, and the camming ring and the horns are so arranged about the hub axis that the plurality of followers on the horns engage respectively the plurality of helical camming grooves. Rotary drive means rotates the camming ring relative to the blades to cause blade pitch to be changed through the cooperative operation of the camming grooves on the ring and the cam followers on the pitch-change horns. Official Gazette of the U.S. Patent and Trademark Office

N79-14096* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTEGRATED GAS TURBINE ENGINE-NACELLE Patent
Arthur P. Adamson (GE, Cincinnati), Donald F. Sargisson (GE, Cincinnati), and Charles L. Stotler, Jr., inventors (to NASA) (GE, Cincinnati) Issued 2 Jan. 1979 9 p Filed 22 Dec. 1976 Continuation of abandoned US Patent Appl. SN-522108, filed 8 Nov. 1974 Sponsored by NASA
(NASA-Case-LEW-12389-3; US-Patent-4,132,069;
US-Patent-Appl-SN-753452; US-Patent-Class-60-226R;
US-Patent-Class-60-226A; US-Patent-Class-60-39.31;
US-Patent-Class-244-54; US-Patent-Class-137-15.1;
US-Patent-Class-415-201; US-Patent-Class-415-200;
US-Patent-Appl-SN-552108) Avail: US Patent and Trademark Office CSCL 21E

A nacelle for use with a gas turbine engine is provided with an integral webbed structure resembling a spoked wheel for rigidly interconnecting the nacelle and engine. The nacelle is entirely supported in its spacial relationship with the engine by means of the webbed structure. The inner surface of the nacelle defines the outer limits of the engine motive fluid flow annulus, while the outer surface of the nacelle defines a streamlined envelope for the engine.
Official Gazette of the U.S. Patent and Trademark Office

N79-14097* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VARIABLE AREA EXHAUST NOZZLE Patent
Everett A. Johnston, inventor (to NASA) (GE, Cincinnati) Issued

2 Jan. 1979 8 p Filed 30 Apr. 1975 Sponsored by NASA (NASA-Case-LEW-12378-1; US-Patent-4,132,068; US-Patent-Appl-SN-573029; US-Patent-Class-60-226A; US-Patent-Class-239-265.39) Avail: US Patent and Trademark Office CSCL 21E

An exhaust nozzle for a gas turbine engine comprises a number of arcuate flaps pivotally connected to the trailing edge of a cylindrical casing which houses the engine. Seals disposed within the flaps are spring biased and extensible beyond the side edges of the flaps. The seals of adjacent flaps are maintained in sealing engagement with each other when the flaps are adjusted between positions defining minimum nozzle flow area and the cruise position. Extensible, spring biased seals are also disposed within the flaps adjacent to a supporting pylon to thereby engage the pylon in a sealing arrangement. The flaps are hinged to the casing at the central portion of the flaps' leading edges and are connected to actuators at opposed outer portions of the leading edges to thereby maximize the mechanical advantage in the actuation of the flaps.

Official Gazette of the U.S. Patent and Trademark Office

N79-14098*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CERAMIC COATING EFFECT ON LINER METAL TEMPERATURES OF FILM-COOLED ANNULAR COMBUSTOR

Russell W. Claus, Jerrold D. Wear, and Curt H. Liebert Jan. 1979 24 p refs

(NASA-TP-1323; E-9732) Avail: NTIS HC A03/MF A01 CSCL 21E

An experimental and analytical investigation was conducted to determine the effect of a ceramic coating on the average metal temperatures of full annular, film cooled combustion chamber liner. The investigation was conducted at pressures from 0.50 to 0.062. At all test conditions, experimental results indicate that application of a ceramic coating will result in significantly lower wall temperatures. In a simplified heat transfer analysis, agreement between experimental and calculated liner temperatures was achieved. Simulated spalling of a small portion of the ceramic coating resulted in only small increases in liner temperature because of the thermal conduction of heat from the hotter, uncoated liner metal. Author

N79-14099*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF SWIRLER-MOUNTED MIXING VENTURI ON EMISSIONS OF FLAME-TUBE COMBUSTOR USING JET A FUEL

David B. Ercegovic Jan. 1979 23 p refs

(NASA-TP-1393; AVRADCOM-TR-78-41; E-9762) Avail: NTIS HC A02/MF A01 CSCL 21E

Six headplate modules in a flame-tube combustor were evaluated. Unburned hydrocarbons, carbon monoxide, and oxides of nitrogen were measured for three types of fuel injectors both with and without a mixing venturi. Tests were conducted using jet A fuel at an inlet pressure of 0.69 megapascal, an inlet temperature of 478 K, and an isothermal static pressure drop of 3 percent. Oxides of nitrogen were reduced by over 50 percent with a mixing venturi with no performance penalties in either other gaseous emissions or pressure drop. G.G.

N79-14100# Northern Research and Engineering Corp., Cambridge, Mass.

FLAMEHOLDER COMBUSTION INSTABILITY STUDY. VOLUME 2: EXPERIMENTAL PROGRAM Final Report, 1 May 1978 - 1 Jan. 1978

E. R. Norster May 1978 104 p refs

(Contract F33615-76-C-2112)

(AD-A059847; NREC-1294-2-Vol-2; AFAPL-TR-78-27-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 21/2

This report details the experimental portion of the Flameholder Combustion Instability investigation of the low frequency combustion instability (rumble) problem found in turbofan augmentors. The study examines: (1) the spacial and temporal variations of pressure and heat-release in a flameholder rig designed to simulate augmentor operating conditions; (2) some possible mechanisms for rumble under widely varying flow conditions; and (3) the characteristic response of different flameholder configurations to longitudinal pressure disturbances. Author (GRA)

N79-14101# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.

TURBINE EXIT GUIDE VANE PROGRAM Final Report, Mar. 1974 - Oct. 1977

W. S. Mitchell and J. F. Soileau Nov. 1977 317 p refs

(Contract F33615-74-C-2060; AF Proj. 3066)

(AD-A060343; PWA-FR-8932; AFAPL-TR-77-75) Avail: NTIS HC A14/MF A01 CSCL 21/5

This report summarizes the results of an Air Force-sponsored Turbine Exit Guide Vane (EGV) Technology Development Program. In the EGV program, non-series EGV airfoils, designed for spanwise maximum inlet Mach numbers of 0.75 and average gas turnings of 38.0 deg (loading levels above those typical of state-of-the-art EGV's) demonstrated high diffusion efficiencies (72.0%) and low total pressure losses (1.5%). The non-series EGV airfoils were designed (using computer graphics design techniques with predicted pressure distributions and predicted boundary layer characteristics) by tailoring the airfoil camber and thickness distributions to minimize the airfoil suction surface rate of diffusion, therefore reducing the potential for flow separation. The non-series EGV airfoils also demonstrated performance improvements relative to equivalent NASA series airfoils. GRA

N79-14102# Teledyne Ryan Aeronautical Co., San Diego, Calif.

RPV ELECTRIC POWER SYSTEM STUDY. PHASE 1: TECHNOLOGY ASSESSMENT Interim Technical Report, 23 Aug. 1976 - 31 Mar. 1978

Frederic L. Miller Jun. 1978 276 p refs

(Contract F33615-76-C-2069; AF Proj. 3145)

(AD-A060336; TRA-29318-06; AFAPL-TR-78-38) Avail: NTIS HC A13/MF A01 CSCL 01/3

The RPV Electric Power Study explores ways for exploiting technology and resolving critical issues affecting the electrical subsystems of remotely piloted vehicles. The objective is to define electrical components and system concepts that offer significant cost, weight, and performance improvements over present day systems. Phase 1 is an assessment of technologies capable of benefitting RPV electrical systems. Phase 2 develops a plan to transfer viable technologies into RPV systems. The scope of the Phase 1 study is limited to four classes of RPV: Advanced multi-mission tactical RPV (ARPV), High-altitude, long endurance RPV (HALE), Mini - RPV, and Tactical expendable decoy system (TEDS). The approach is to first survey suitable technology, estimate future requirements, determine the most critical problems in RPV electrical systems, and suggest changes to military specifications and standards to make them more compatible with RPVs. For each RPV class, a series of candidate electrical systems is synthesized spanning the spectrum of potentially viable systems. These are evaluated against a set of weighted evaluation criteria and the best approaches selected. GRA

N79-14103# Washington Univ., Seattle.

THE AEROTHERMODYNAMICS OF AIRCRAFT GAS TURBINE ENGINES Final Report, 1975 - 1978

Gordon C. Oates, ed. Wright-Patterson AFB, Ohio AFAPL Jul. 1978 782 p refs

(Grant AF-AFOSR-2783-75)

(AD-A059784; AFAPL-TR-78-52) Avail: NTIS HC A99/MF A01 CSCL 21/5

An extensive study of many aspects of the aerothermodynamics of aircraft gas turbine engines is presented. The study consists of twenty-six chapters written by a total of twenty-four authors. After an initial comprehensive introductory chapter, the report provides a review of thermodynamics and gas dynamics and of laminar and turbulent flows. The cycle analysis of ideal engines is then considered, followed by the description of component losses and then the cycle analysis of non-ideal engines. Engine off-design performance is then considered followed by the description of engine/airplane matching. Succeeding chapters consider the behavior of the various components in detail. Major problem areas such as computation of turbomachinery boundary layers, aeroelasticity and unsteady aerodynamics, engine stability, engine noise, jet noise and finally the system aspects of engine installation are considered in detail. The document is intended to serve many purposes, including those of text, design manual, research reference and comprehensive overview of the aerothermodynamics of aircraft gas turbine engines. Author (GRA)

N79-14104# Hamilton Standard, Windsor Locks, Conn. Hamilton Standard Div.

DISASSEMBLY INSPECTION AND OVERHAUL OF X-22A GEAR REDUCTION AND PROPELLER ASSEMBLIES Final Report, May 1977 - Jul. 1978

E. H. Walz Jul. 1978 105 p

(AD-A059795; NADC-76220-60) Avail: NTIS HC A06/MF A01 CSCL 01/3

This report presents the results of the disassembly inspection and overhaul of four Hamilton Standard designed and fabricated X-22A gear reduction and propeller assemblies. These units have operated intermittently since 1966 and had accumulated a total of 574 flight research hours. All functional components appeared to be in satisfactory condition and, following minor corrective action, the units were returned to service. Author (GRA)

N79-14105# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.

COMPARTMENTAL LUBRICATION SYSTEM Final Report, 6 Oct. 1975 - 1 Apr. 1978

E. M. Beverly Jun. 1978 315 p

(Contract F33615-75-C-2075)

(AD-A060172; PWA-FR-9555; AFAPL-TR-78-32) Avail: NTIS HC A14/MF A01 CSCL 11/8

An optimum low vulnerability engine compartmental lubrication system concept was selected from quantitative analysis of five candidate schemes. The five schemes were configured based on qualitative evaluations of many lubrication system components and locations of components. Analysis showed the selected system would provide significant improvements in the areas of reduced vulnerability, maintainability, system cost, frontal area, and increased reliability compared to the F100-PW-100 engine. GRA

N79-14106# United Technologies Research Center, East Hartford, Conn.

RESEARCH ON CENTRIFUGAL EFFECTS ON TURBINE ROTOR BLADE FILM COOLING Final Report, May 1977 - Jul. 1978

Robert P. Dring, Michael F. Blair, and H. David Joslyn Aug. 1978 73 p refs

(Contract F33615-77-C-2068)

(AD-A060202; UTRC/R78-912944-7; AFAPL-TR-78-63) Avail: NTIS HC A04/MF A01 CSCL 21/5

Film cooling has been studied on the rotor blade of a large scale (low speed) model of a high pressure turbine first stage. Film coolant was discharged from single holes on the pressure and suction surfaces on the airfoil. For each blowing site the coolant-to-free stream mass flux ratio and density ratio were varied from 0.5 to 1.5 and from 1.0 and 4.0 respectively. Both surface flow visualization and local film cooling effectiveness data were obtained. Film coolant effectiveness data is presented in the form of effectiveness profiles and contours downstream of each hole. The observation was made that although it can have a strong radial component, the trajectory of the film coolant was very insensitive to coolant flow conditions. The existence of the radial component of the film coolant trajectory was found to have a strong impact on the nature of the effectiveness distributions. The data have been compared with data taken by other investigators on flat surfaces and in plane cascades. Agreement between the flat plate data and the suction surface data was reasonably good. However, the pressure surface results showed a much faster decay of the effectiveness than did the flat plate data due to effects thought to be related to both curvature and radial flow. Author (GRA)

N79-14107# Civil and Environmental Engineering Development Office, Tyndall AFB, Fla. Detachment 1 ADTC

AIR QUALITY ANALYSIS OF POSSIBLE F-15 AND A-10 AIRCRAFT ENGINE MODIFICATIONS TO REDUCE POLLUTION Final Report, May 1977 - May 1978

Dennis F. Naugle, Peter S. Daley, and Harold A. Scott, Jr. Jun. 1978 32 p refs

(AF Proj. 2103)

(AD-A059976; CEEDO-TR-78-35) Avail: NTIS HC A03/MF A01 CSCL 21/5

The Air Force has established goals for the control of aircraft engine exhaust emissions. Neither the F-15 nor A-10 aircraft engines completely meet these goals even though they are much less polluting than the F-4E and A-7 aircraft they often replace. This study compares air quality impacts of all four aircraft and shows the relative improvements possible with a modification/retrofit program for the F-15 and A-10 aircraft. Significant improvement is obtainable only for the A-10 hydrocarbon emissions. A five step analytical methodology is presented and can be adapted to nearly any aircraft related air quality assessment problem. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N79-14108* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

VORTEX-LIFT ROLL-CONTROL DEVICE Patent

John E. Lamar, inventor (to NASA) Issued 2 Jan. 1979 6 p Filed 21 Mar. 1977 Supersedes N77-31176 (15 - 22 p 2900) Continuation-in-part of abandoned US Patent Appl. SN-651002, filed 21 Jan. 1976

(NASA-Case-LAR-11868-2; US-Patent-4,132,375; US-Patent-Appl-SN-779429; US-Patent-Class-244-90R; US-Patent-Class-244-218; US-Patent-Class-244-46; US-Patent-Appl-SN-651002) Avail: US Patent and Trademark Office CSCL 01C

A wing is described for aircraft of cropped, arrow-type planform with thin leading and side edges. The wing has a pivotable tip to alter the crop angle of the wing during flight. Increasing the crop angle causes the wing side edge to become a trailing edge which reduces the strength of the side edge vortex flow. Decreasing the crop angle causes opposite results, in particular the side edge is now a leading edge and can generate a leading edge vortex flow. The wing constitutes a roll control device for aircraft of the stated design particularly effective at higher angles of attack.

Official Gazette of the U.S. Patent and Trademark Office

N79-14109*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.

DIGITAL FLY-BY-WIRE FLIGHT CONTROL VALIDATION EXPERIENCE

Kenneth J. Szalai, Calvin R. Jarvis, Gary E. Krier, Vincent A. Megna (Charles Stark Draper Lab., Inc.,), Larry D. Brock (Charles Stark Draper Lab., Inc.,), and Robert N. ODonnell (Charles Stark Draper Lab., Inc.,) Dec. 1978 241 p refs

(NASA-TM-72860; R-1164; H-1080) Avail: NTIS HC A11/MF A01 CSCL 01C

The experience gained in digital fly-by-wire technology through a flight test program being conducted by the NASA Dryden Flight Research Center in an F-8C aircraft is described. The system requirements are outlined, along with the requirements for flight qualification. The system is described, including the hardware components, the aircraft installation, and the system operation. The flight qualification experience is emphasized. The qualification process included the theoretical validation of the basic design, laboratory testing of the hardware and software elements, systems level testing, and flight testing. The most productive testing was performed on an iron bird aircraft, which used the actual electronic and hydraulic hardware and a simulation of the F-8 characteristics to provide the flight environment. The iron bird was used for sensor and system redundancy management testing, failure modes and effects testing, and stress testing in many cases with the pilot in the loop. The flight test program confirmed the quality of the validation process by achieving 50 flights without a known undetected failure and with no false alarms. S.E.S.

N79-14110*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THEORETICAL STUDY OF THE EFFECT OF WIND VELOCITY GRADIENTS ON LONGITUDINAL STABILITY AND CONTROL IN CLIMBING AND LEVEL FLIGHT

Windsor L. Sherman Dec. 1978 21 p refs

(NASA-TP-1332; L-12273) Avail: NTIS HC A02/MF A01 CSCL 01C

A change in the wind vector over a short distance along the flight path (wind gradient) has caused several severe airplane accidents during take-off and landing. Results of a previous study showed that, in descending flight, a positive wind gradient (decreasing head wind) caused severe divergent motion and a negative wind gradient (decreasing tail wind) caused oscillatory motion which should not create a control problem. The results obtained when the same method of analysis was applied to climbing and to straight and level flight are reported. In straight and level flight, a wind gradient was found to cause effects similar to those found in descending flight. In climbing flight, it was found that a negative wind gradient caused a slightly divergent oscillation that presented no control problems and a positive wind gradient caused oscillatory divergence. Results of motion studies indicated that adequate control of the airplane motions can be provided by automatic control systems. S.E.S.

N79-14111# Army Aviation Research and Development Command, St. Louis, Mo.

DIGITAL SYMBOLOGY GENERATOR PROGRAM

Tunis Robbins Sep. 1978 98 p

(DA Proj. 1L2-62202-AH-85)

(AD-A060216; USAAVRADCOM-TR-78-43) Avail: NTIS HC A05/MF A01 CSCL 01/3

A digital symbology generator program is described. This program, written for an SKC-2000 Airborne Computer, is the software portion of an airborne Digital Symbology Generator (DSG) developed by the Avionics Research and Development Activity for use in simulation and flight test programs. The DSG is capable of displaying a variety of command and flight control symbols in a raster format on a standard 525 line TV monitor. The displayed output provides 256 by 256 pixels (picture elements) and can be updated at the standard TV frame rate of 30 sec.

Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N79-14112# Committee of the Whole House on the State of the Union (U. S. House).

FAA DETERMINATION OF NO HAZARD FOR STRUCTURES NEAR AIRPORTS

Washington GPO 1978 24 p Rept. by Comm. on Government Operations, 95th Congr., 2d Sess., 12 Apr. 1978

(H-Rept-95-1053; GPO-29-006; Rept-22) Avail: US Capitol, House Document Room

Testimony on FAA procedures and practices for determining whether buildings or other objects located near airports are obstructions in navigating airspace and air hazards to air navigation is presented. Procedures of the FCC in granting licenses and construction permits for antenna towers are also examined.

S.B.S.

N79-14113*# Calspan Corp., Buffalo, N. Y.

THE TOTAL IN-FLIGHT SIMULATOR (TIFS) AERODYNAMICS AND SYSTEMS: DESCRIPTION AND ANALYSIS Final Report

D. Andrisani, II, H. Daughaday, J. Dittenhauser, and E. Rynaski Nov. 1978 283 p refs Sponsored in part by NASA Langley Res. Center

(Contract F33615-73-C-3051)

(NASA-CR-158965; CALSPAN-AK-5280-F-10-Rev-1) Avail: NTIS HC A13/MF A01 CSCL 14B

The aerodynamics, control system, instrumentation complement and recording system of the USAF Total In/Flight Simulator (TIFS) airplane are described. A control system that would allow the ailerons to be operated collectively, as well as, differentially to entrance the ability of the vehicle to perform the dual function of maneuver load control and gust alleviation is emphasized. Mathematical prediction of the rigid body and the flexible equations of longitudinal motion using the level 2.01 FLEXSTAB program are included along with a definition of the vehicle geometry, the mass and stiffness distribution, the calculated mode frequencies and mode shapes, and the resulting aerodynamic equations of motion of the flexible vehicle. A complete description of the control and instrumentation system of the aircraft is presented, including analysis, ground test and flight data comparisons of the performance and bandwidth of the aerodynamic surface servos. Proposed modification for improved performance of the servos are also presented. J.M.S.

N79-14114*# Systems Technology, Inc., Mountain View, Calif.

PILOTED AIRCRAFT SIMULATION CONCEPTS AND OVERVIEW

John B. Sinacori Mar. 1978 100 p refs

(Contract NAS2-9024)

(NASA-CR-152200; STI-TR-1074-2) Avail: NTIS HC A05/MF A01 CSCL 01C

An overview of piloted aircraft simulation is presented that reflects the viewpoint of an aeronautical technologist. The intent is to acquaint potential users with some of the basic concepts and issues that characterize piloted simulation. Application to the development of aircraft are highlighted, but some aspects of training simulators are covered. A historical review is given together with a description of some current simulators. Simulator usages, advantages, and limitations are discussed and human perception qualities important to simulation are related. An assessment of current simulation is presented that addresses validity, fidelity, and deficiencies. Future prospects are discussed and technology projections are made. Author

N79-14115# H. H. Aerospace Design Co., Inc., Bedford, Mass.

THE FAA'S AIRPORT LANDSIDE MODEL: ANALYTICAL APPROACH TO DELAY ANALYSIS Final Report

Daniel Gentry and Kristy M. Doyle Jan. 1978 106 p refs

(Contract DOT-FA76WAI-643)

(AD-A051145; FAA-AVP-78-2) Avail: NTIS HC A06/MF A01 CSCL 01/5

Computer implemented analytic models have been developed which will assist in the quantitative assessment of the adequacy of the airport landside; that is, the portion of the airport property not utilized by aircraft. The primary measures of adequacy are passenger delay and passenger processing time. Detailed analytic models have been derived using queuing theory for those airport landside components which are essential to passenger processing. Also, a landside analysis program has been developed to quantify airport landside delay and capacity. The major outputs of this program are the per passenger processing times and cumulative processing times at each terminal unit and groundside area in an airport for both enplaning and deplaning passengers, and a summary of the delay and total processing times at an airport by terminal and for the entire airport. Processing time is separated into delay, service, and travel time. This program has been applied to the existing and planned facilities at the large hub air carrier airports and a large data base has been created for these large hub airports. The data base is constructed so the data can be modified or additional data input can be made in a relatively straightforward manner. Author (GRA)

N79-14116# Federal Aviation Administration, Washington, D. C. Office of Airports Programs.

A REVIEW OF CERTIFICATED AIRPORT CRASH FIRE RESCUE SERVICE CRITERIA Final Report

Bertrand F. Ruggles Dec. 1977 26 p refs

(AD-A053110; FAA-AAP-78-1) Avail: NTIS HC A03/MF A01 CSCL 01/5

This study reviews the minimum level of crash fire suppression service required by Federal Aviation Regulation (FAR) Part 139 and compares the required minimum with the recommended level for Index A, AA and B airports. It outlines the economic impact of the present airport index threshold criteria. It presents a discussion of the expected hazard, the population base, and the operational base as factors affecting the level of crash, fire and rescue (CFR) services required at airports and as factors affecting the airport's ability to support that level of CFR

service. Conclusions are presented relative to the feasibility of fulfilling the following objectives: (1) Enhance the overall safety of airport operations at all Index A and AA airports without incurring increased operation and maintenance costs; (2) Minimize the increase in the operation and maintenance costs of CFR services presently being experienced by airport owners/operators when transitioning from Index AA to Index B certification; and (3) Reduce the operations and maintenance costs of CFR services currently being provided at small Index B airports while maintaining or enhancing the present level of safety. Author (GRA)

N79-14117# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.

A THERMAL INVESTIGATION OF THE AFAPL TURBINE ENGINE HEAT TRANSFER TEST FACILITY Final Report, Mar. - Dec. 1974

John A. Vonada Feb. 1978 93 p refs
(AF Proj. 3066)
(AD-A059338; AFAPL-TR-77-52) Avail: NTIS HC A05/MF A01 CSCL 14/2

An experimental investigation of the Heat Transfer Test Facility at the Air Force Aero Propulsion Laboratory was conducted to determine gas temperature distributions in the facility's combustion chamber. The combustor consists of an air-fed, water-cooled duct with a hydrogen fuel injector system. Gas temperatures in the range of 1000 F to 3000 F were studied. The combustion chamber pressure was 3.4 atm, and its air mass flow rate varied from 1.0-3.0 lbm/sec. Configurations of type-K and type-R thermocouples were used to measure temperature profiles parallel and perpendicular to the gas stream flow in the combustion chamber. These measurements indicated that a fairly uniform turbulent temperature profile developes at gas temperatures above 2000 F. In addition, the gas temperature was determined by (1) a thermal calculation which was based on the temperature decrease of the gas from the adiabatic flame temperature as a result of heat loss, and (2) a transient type K thermocouple probe. The thermal calculation agreed with experimental data to within 6% at gas flow rates of 2.0 and 3.0 lbm/sec.
Author (GRA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N79-14118*# Battelle Columbus Labs., Ohio.

REVIEW OF INDUSTRY INTEREST IN SPACE PROCESSING Final Report

J. R. McDowell Apr. 1978 6 p
(Contract NASw-2800)
(NASA-CR-158026; BCL-OA-TFR-78-2) Avail: NTIS HC A02/MF A01 CSCL 22A

The interest on the part of selected U.S. corporation in using the research facilities and capabilities for materials processing in space utilizing the Space Shuttle was assessed. The effectiveness of the interview techniques as a method for gaining insight into the complex array of issues related to materials processing in space was evaluated. The survey, conducted was intended as a random sample of individuals, representing industry, who were currently involved in materials processing in space.
B.B.

N79-14119*# Battelle Columbus Labs., Ohio.

SURVEY OF UNIVERSITY PROGRAMS IN REMOTE SENSING FUNDED UNDER GRANTS FROM THE NASA UNIVERSITY-SPACE APPLICATIONS PROGRAM Final Report

J. A. Madigan and R. W. Earhart 31 Mar. 1978 70 p
(Contract NASw-2800)
(NASA-CR-158024; BCL-OA-TFR-78-3) Avail: NTIS HC A04/MF A01 CSCL 22A

NASA's Office of Space and Terrestrial Applications (OSTA) is currently assessing approaches to transferring NASA technology to both the public and private sectors. As part of this assessment, NASA is evaluating the effectiveness of an ongoing program in remote sensing technology transfer conducted by 20 university contractors/grantees, each supported totally or partially by NASA funds. The University-Space Applications program has as its objective the demonstration of practical benefits from the use of remote sensing technology to a broad spectrum of new users, principally in state and local governments. To evaluate the University-Space Applications program, NASA has a near-term requirement for data on each university effort including total funding, funding sources, length of program, program description, and effectiveness measures. G.Y.

N79-14120*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

NONTERRESTRIAL MATERIAL PROCESSING AND MANUFACTURING OF LARGE SPACE SYSTEMS

Georg F. Von Tiesenhausen Nov. 1978 31 p refs
(NASA-TM-78207) Avail: NTIS HC A03/MF A01 CSCL 22A

An attempt is made to provide pertinent and readily usable information on the extraterrestrial processing of materials and manufacturing of components and elements of these planned large space systems from preprocessed lunar materials which are made available at a processing and manufacturing site in space. Required facilities, equipment, machinery, energy and manpower are defined. Author

N79-14993# Joint Publications Research Service, Arlington, Va.

GLUSHKO COMMENTS ON SOVIET SPACE DEVELOPMENT

Valentin Petrovich Glushko *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 63-67 Transl. into ENGLISH from Zemlya Vselennaya (Moscow), no. 6, 1978 p 56-58 (For primary document see N79-14983 05-99)
Copyright. Avail: NTIS HC A05/MF A01

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N79-14121*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

FLIGHT MECHANICS/ESTIMATION THEORY SYMPOSIUM

May 1978 289 p refs Symp. held at Greenbelt, Md., 18-19 Oct. 1977
(NASA-CP-2050) Avail: NTIS HC A13/MF A01 CSCL 22A

Satellite attitude determination and control, orbit determination, and onboard and ground attitude determination procedures are among the topics discussed. Other topics covered include: effect of atmosphere on Venus orbiter navigation; satellite-to-satellite tracking; and satellite onboard navigation using global positioning system data. For individual titles, see N79-14122 through N79-14135.

N79-14122*# Naval Research Lab., Washington, D. C.

COMPRESSION OF EPHEMERIDES BY DISCRETE CHEBYSHEV APPROXIMATIONS

H. M. Pickard, A. Deprit (Cincinnati Univ.), and W. Poplarchek *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 1-17 refs (For primary document see N79-14121 05-13)
Avail: NTIS HC A13/MF A01 CSCL 05B

The use of Chebyshev series in representing the ephemerides of satellites and planets in terms of truncated polynomial series is discussed. Emphasis is placed on a FORTRAN package which was developed for fitting satellite orbits. The features desired in any approximation are: (1) the ability to compress a satellite emphemeris; (2) the ability to represent a satellite ephemeris over several orbits; (3) guaranteed accuracy to within prescribed tolerance over the time interval of consideration; and (4) fast processing. These features are imposed with an eye towards adapting the approximation for use on microprocessor applications in which storage is limited and real time processing is required. J.M.S.

N79-14123*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.

APPLICATION OF SEMIANALYTICAL SATELLITE THEORIES TO PRECISION ORBIT DETERMINATION

P. J. Cefola *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 18-27 refs (For primary document see N79-14121 05-13)

Avail: NTIS HC A13/MF A01 CSCL 22A

Those factors which limit the usefulness of current implementations of the semianalytical approach are discussed. Numerical and analytical enhancements to the semianalytical approach are considered. A simple mathematical model is provided to estimate the computational speed of a semianalytical theory employing the suggested enhancements. The model can factor in current experience with semianalytical theories (integration stepsizes, quadrature orders, speed of recursive formulations, etc.) and the characteristics of the particular output requirement (observation span (or orbit determination interval), observation rate, observation model, etc.). Comparisons with numerical integration are suggested. J.M.S.

N79-14124*# Cincinnati Univ., Ohio. Dept. of Mathematical Sciences.

CRITICAL INCLINATIONS IN SATELLITE THEORY

Andre Deprit *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 28-32 (For primary document see N79-14121 05-13)

Avail: NTIS HC A13/MF A01 CSCL 22A

The main problem of satellite theory is described in polar coordinates by a Hamiltonian function. It is proposed to find a solution of the Hamiltonian function with the following properties: (1) the reference orbit is Keplerian; (2) no restriction is imposed on the eccentricity; in particular, it is exempt of singularities - real or apparent - for small eccentricities; and (3) no restriction is imposed on the inclination; in particular, it is exempt of singularities - real or apparent - for small inclinetions; also it is valid even in the neighborhood of inclinations at which the perigee is stationary. J.M.S.

N79-14125*# Analytical and Computational Mathematics, Inc., Houston, Tex.

A SINGULARITY FREE ANALYTICAL SOLUTION OF ARTIFICIAL SATELLITE MOTION WITH DRAG

Alan Mueller *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 33-36 refs (For primary document see N79-14121 05-13)

Avail: NTIS HC A13/MF A01 CSCL 22A

An analytical satellite theory based on the regular, canonical Poincare-Similar (PS phi) elements is described along with an accurate density model which can be implemented into the drag theory. A computationally efficient manner in which to expand the equations of motion into a fourier series is discussed. J.M.S.

N79-14126*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

DENSITY MODELS FOR THE UPPER ATMOSPHERE

Douglas L. Dowd and B. D. Tapley (Texas Univ., Austin) *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 38-78 refs (For primary document see N79-14121 05-13)

(Contract NAS5-20946; Grant NsG-5154)

Avail: NTIS HC A13/MF A01 CSCL 04A

Consideration is given to three contemporary atmospheric density models which have been selected as the best candidates to meet the requirements of satellite missions. The models considered are the Analytic Jacchia-Roberts Model, the Modified Harris-Priester Model, and the U.S.S.R. Cosmos Satellite Derived Density Model. Each of the models and their respective variations is discussed separately, and a comparison of the computational characteristics of the models is presented. Finally, recommended modifications for improving both the computation speed and accuracy are presented. J.M.S.

N79-14127*# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

A DEMONSTRATION OF THE VALUE OF GENERAL PURPOSE, ON-BOARD SATELLITE COMPUTERS

Robert E. Jenkins and J. Miller Whisnant *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 79-119 refs (For primary document see N79-14121 05-13)

Avail: NTIS HC A13/MF A01 CSCL 09B

Failure of the solar panels to erect and spin stabilize the TRANSIT Improvement Program (TIP) satellites is discussed, with emphasis on how the flight computer was reprogrammed to perform various control functions in order to achieve a partial mission success. These functions include: (1) power management to avoid troublesome spacecraft blackouts; (2) achieve enough spin stability to fire the OATS thruster; (3) raise the parking orbit to a workable altitude; (4) remove a high tumble rate which was the indirect result of the failure; and (5) deploy the gravity-gradient boom successfully on TIP-3. J.M.S.

N79-14128*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ORBIT DETERMINATION ACCURACIES USING SATELLITE-TO-SATELLITE TRACKING

F. O. Vonbun, P. D. Argentiero, and P. E. Schmid *In its* Flight Mechanics/Estimation Theory Symp. May 1978 p 121-152 refs (For primary document see N79-14121 05-13)

Avail: NTIS HC A13/MF A01 CSCL 22A

The results of the ATS-6/GEOS-3 and the ATS-6/NIMBUS-6 satellite-to-satellite tracking orbit determination experiments are reported. The tracking systems used in these experiments differ from the Tracking and Data Relay Satellite System (TDRSS), primarily in the use of one rather than two synchronous relay satellites. However, the simulations mentioned indicate that the insights gained from the experiments with regard to proper data reduction techniques and expected results are applicable to the TDRSS. J.M.S.

N79-14129*# Martin Marietta Aerospace, Denver, Colo.

ON-BOARD LANDMARK NAVIGATION AND ATTITUDE REFERENCE PARALLEL PROCESSOR SYSTEM

Lloyd E. Gilbert and Dhema T. Mahajan *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 153-177 refs (For primary document see N79-14121 05-13)

Avail: NTIS HC A13/MF A01 CSCL 17B

An approach to autonomous navigation and attitude reference for earth observing spacecraft is described along with the landmark identification technique based on a sequential similarity detection algorithm (SSDA). Laboratory experiments undertaken to determine if better than one pixel accuracy in registration can be achieved consistent with onboard processor timing and capacity constraints are included. The SSDA is implemented using a multi-microprocessor system including synchronization logic and chip library. The data is processed in parallel stages, effectively reducing the time to match the small known image within a larger image as seen by the onboard image system. Shared memory is incorporated in the system to help communicate intermediate results among microprocessors. The functions include finding mean values and summation of absolute differences over the image search area. The hardware is a low power, compact unit suitable to onboard application with the flexibility to provide for different parameters depending upon the environment. J.M.S.

N79-14130*# Honeywell, Inc., Minneapolis, Minn. Avionics Div.

AUTONOMOUS SATELLITE ORBITAL NAVIGATION AND ATTITUDE DETERMINATION

Shing Peter Kau *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 178-193 refs (For primary document see N79-14121 05-13)

Avail: NTIS HC A13/MF A01 CSCL 17B

A known linear landmark navigation system is described. It involves the use of an electro-optical sensor to provide sightings to linear earth features such as highways and coast lines. The sensor concept and the navigation system mechanization are described. Performance analysis results show that landmark sightings provide accurate navigation update and that this accuracy can be preserved using radar altimeter measurements. Description of a stellar inertial attitude determination system is also presented. Attitude reference performance consistent with the requirement of the navigation system is shown to be achievable by this method. Author

N79-14131*# National Environmental Satellite Service, Washington, D. C.
THE OPERATIONAL FEASIBILITY OF ORBIT AND ATTITUDE DETERMINATION FOR THE GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE (SMS/GEOS) USING ONLY IMAGERY DATA
E. Mack, M. Jurotich, and B. Remondi *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 194-206 (For primary document see N79-14121 05-13)
Avail: NTIS HC A13/MF A01 CSCL 22A

Experimental results from three evaluation periods on three geostationary spacecraft (SMS-2, GOES-1, and GOES-2) are presented. It is shown that using existing landmark extraction and identification techniques (1) for east geostationary spacecraft, a high quality orbit and attitude state is maintained with imagery data only, and (2) for west geostationary spacecraft, a high quality orbit and attitude state is recovered with imagery data only in approximately seven days. J.M.S.

N79-14132*# Computer Sciences Corp., Silver Spring, Md.
RECURSIVE ESTIMATOR FOR OSO-8 ATTITUDE
Robert D. Headrick and Duke Y. Park *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 207-218 refs (For primary document see N79-14121 05-13)
(Contracts NAS5-11999; NAS5-24300)
Avail: NTIS HC A13/MF A01 CSCL 22A

Modifications and enhancements that have been made to the Recursive Estimation Attitude Program (REAP) are discussed. Continuous attitudes for OSO-8 to + or - 0.05 degree accuracy are determined from Sun and star slit sensors mounted on the spinning portion of the spacecraft. The bulk of the attitude production is performed by a Weighted Least Squares (WLS) batch processor, but REAP is used for problem passes such as those involving gas jet maneuvers, sparse star fields, or star sensor saturation by high energy particles in the South Atlantic Anomaly. J.M.S.

N79-14133*# Computer Sciences Corp., Silver Spring, Md.
PERFORMANCE OF GROUND ATTITUDE DETERMINATION PROCEDURES FOR HEAO-1
Lawrence Fallon, III and Conrad R. Sturch *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 219-236 refs (For primary document see N79-14121 05-13)
(Contract NAS5-11999)
Avail: NTIS HC A13/MF A01 CSCL 22D

Ground attitude support for HEAO 1 provided at GSFC by the HEAO 1 Attitude Ground Support System (AGSS) is described. Information telemetered from Sun sensors, gyroscopes, star trackers, and an onboard computer are used by the AGSS to compute updates to the onboard attitude reference and gyro calibration parameters. The onboard computer utilizes these updates in providing continuous attitudes (accurate to 0.25 degree) for use in the observatory's attitude control procedures. The relationship between HEAO 1 onboard and ground processing, the procedures used by the AGSS in computing attitude and gyro calibration updates, and the performance of these procedures in the HEAO 1 postlaunch environment is discussed. J.M.S.

N79-14134*# Computer Sciences Corp., Silver Spring, Md.
ISEE-C ATTITUDE DETERMINATION USING FINE SUN SENSOR DATA ONLY
Lawrence P. Gunshol *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 237-258 (For primary document see N79-14121 05-13)
(Contract NAS5-11999)
Avail: NTIS HC A13/MF A01 CSCL 22A

Techniques developed to determine the spin axis attitude using Fine Sun Sensor (FSS) data only are described. At any given time, the Sun angle specifies the orientation of the spin axis relative to the sunline. The instantaneous time rate of change of the sun angle is directly proportional to the orientation of the spin axis relative to a reference plane that is normal to the ecliptic. Thus, the spin axis attitude can be determined when sufficient data has been collected to accurately measure the rate of change of the sun angle. The uncertainties can be computed directly from the uncertainties in the coefficients of the smoothed sun angle curve. The FSS-only technique is unique in that ephemeris vectors are required only to transform the attitude results to more conventional coordinate frames. The combination of the mission geometry and the FSS accuracy make ISEE-C an ideal mission for applying this method. However, the technique can be used on other missions, such as spin stabilized geosynchronous missions. J.M.S.

N79-14135*# Computer Sciences Corp., Silver Spring, Md.
INFRARED HORIZON SCANNER ATTITUDE DATA ERROR ANALYSIS FOR SEASAT-A
M. C. Phenneger, C. Manders, C. B. Spence, Jr., M. Levitas, and G. M. Lerner *In* NASA. Goddard Space Flight Center Flight Mechanics/Estimation Theory Symp. May 1978 p 259-281 (For primary document see N79-14121 05-13)
(Contract NAS5-11999)
Avail: NTIS HC A13/MF A01 CSCL 22D

The results of a study of the effect of variations in the earth's seasonal and geographical horizon radiance on the location of the infrared horizon as measured by ITHACO scanwheels are presented. Two types of variations are considered. These are (1) systematic variations of the mean (averaged over all longitudes) atmospheric radiance due to macroscopic changes in temperature as a function of latitude and season and (2) random variations in atmospheric radiance due to microscopic fluctuations (weather). The effect of variations in the scanner wheel speeds on the attitude determination accuracy is also presented. The computed horizon radiance and wheel speed variation - induced attitude errors are then combined with errors caused by sensor alignment and electronics tolerances to obtain an overall estimate of the SEASAT-A pitch and roll angle accuracy. J.M.S.

N79-14136*# Intermetrics, Inc., Cambridge, Mass.
EARTH RECOVERY MODE ANALYSIS FOR A MARTIAN SAMPLE RETURN MISSION
J. P. Green 23 Jun. 1978 107 p refs Sponsored by NASA Prepared for JPL
(Contract JPL-955036)
(NASA-CR-158047; IR-287) Avail: NTIS HC A06/MF A01 CSCL 22A

The analysis has concerned itself with evaluating alternative methods of recovering a sample module from a trans-earth trajectory originating in the vicinity of Mars. The major modes evaluated are: (1) direct atmospheric entry from trans-earth trajectory; (2) earth orbit insertion by retropropulsion; and (3) atmospheric braking to a capture orbit. In addition, the question of guided vs. unguided entry vehicles was considered, as well as alternative methods of recovery after orbit insertion for modes (2) and (3). A summary of results and conclusions is presented. Analytical results for aerodynamic and propulsive maneuvering vehicles are discussed. System performance requirements and alternatives for inertial systems implementation are also discussed. Orbital recovery operations and further studies required to resolve the recovery mode issue are described. G.Y.

N79-14137# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
REENTRY-VEHICLE DISPERSION FROM ENTRY ANGULAR MISALIGNMENT Interim Report
Daniel H. Platus 24 Aug. 1978 36 p refs
(Contract F04701-77-C-0078)
(AD-A059653; TR-0078(3940-02)-3; SAMSO-TR-78-123)
Avail: NTIS HC A03/MF A01 CSCL 16/2

An approximate solution is obtained for the dispersion of a reentry vehicle caused by an initial angular misalignment between the vehicle axis of symmetry and the velocity vector at entry into the atmosphere. The dispersion depends on the exoatmospheric motion, which determines the precession mode of the lift vector during angle-of-attack convergence. Maximum dispersion results from an initial angular misalignment in absence of exoatmospheric coning motion. The trajectory deflection for this case occurs in a plane that leads the plane of initial angular misalignment by approximately 90 deg. The dispersion is approximately proportional to roll rate, in contrast to dispersion

from body-fixed asymmetries, which varies inversely with roll rate. Author (GRA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N79-14138# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A LOW-COST STRETCHED VISSR IMAGERY GROUND FACILITY
Carlos E. Santana, Wilton Fleming, Jose Roberto deOliveira, Valter Rodrigues, Luiz Ferando Munoz, and Francisco E. C. Viola Nov. 1978 20 p refs Proposed for presentation at ICC 79, Boston, 10-13 Jun. 1979
(INPE-1392-PE/184) Avail: NTIS HC A02/MF A01

A low cost synchronous meteorological satellite ground terminal was developed which is capable of direct readout of the Stretched VISSR (Visible and Infrared Spin Scan RADIOMETER) data transmitted on S-band by the SMS/GOES series of satellites. Station design concept, the subsystems implementation and the results achieved are included. J.M.S.

N79-14139*# Grumman Aerospace Corp., Bethpage, N.Y.
APPLICABILITY OF THE REMOTE MOBILE EMPLACEMENT PACKAGE (RMEP) DESIGN AS A MOBILITY AID FOR PROPOSED POST-84 MARS MISSIONS, PHASE O
17 May 1978 78 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955064)
(NASA-CR-158041; GAC-PDR-703-2) Avail: NTIS HC A05/MF A01 CSCL 03B

The results of study to determine the applicability of the Remote Mobile Emplacement Package (RMEP) design concept as a mobility aid for the proposed post-'84 Mars missions are presented. The RMEP wheel and mobility subsystem parameters: wheel tire size, weight, stowed volume, and environmental effects; obstacle negotiation; reliability and wear; motor and drive train; and electrical power demand were reviewed. Results indicated that: (1) the basic RMEP wheel design would be satisfactory, with additional attention to heating, side loading, tread wear and ultraviolet radiation protection; (2) motor and drive train power requirements on Mars would be less than on Earth; and (3) the mobility electrical power requirements would be small enough to offer the option of operating the Mars mini rover untethered. Payload power required for certain sampling functions would preclude the use of battery power for these missions. Hazard avoidance and reverse direction maneuvers are discussed. Limited examination of vehicle payload integration and thermal design was made, pending establishment of a baseline vehicle/payload design. J.M.S.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N79-14140*# General Electric Co., Philadelphia, Pa.
INDUSTRY/GOVERNMENT SEMINAR ON LARGE SPACE SYSTEMS TECHNOLOGY: EXECUTIVE SUMMARY Final Report
Sinclaire M. Scala Dec. 1978 21 p refs
(Contract NAS1-9100)
(NASA-CR-2964) Avail: NTIS HC A02/MF A01 CSCL 22B

The critical technology developments which the participating experts recommend as being required to support the early generation large space systems envisioned as space missions during the years 1985-2000 are summarized. J.M.S.

N79-14141# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 615
17 Jan. 1979 20 p Transl. into ENGLISH from various East European journals
(JPRS-72645) Avail: NTIS HC A02/MF A01

The development of and progress in the various theoretical and applied scientific disciplines and technical fields are reported. The administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences, are presented. For individual title, see N79-14142.

N79-14142# Joint Publications Research Service, Arlington, Va.
EARTH SATELLITE IN ORBIT, PROGRESS DETAILED: MAGNION IN ORBIT
Vaclav Bumba *In its* Transl. on Eastern Europe: Sci. Affairs, No. 615 (JPRS-72645) 17 Jan. 1979 p 7-15 Transl. into ENGLISH from Rude pravo (Prague), 15 Nov. 1978 p1 (For primary document see N79-14141 05-15)
Avail: NTIS HC A02/MF A01

The temporal and spatial structure of low frequency electromagnetic fields in the ionosphere and magnetosphere of the earth is studied. The research is conducted by the simultaneous measurement of several selected indicators by two space objects moving in the same trajectory. The measurement data are transmitted to stations on earth by two telemetric transmitters operating on frequencies from 137 to 400 MHz. The operation of the satellites is controlled by a command communications system whose flight deck part is composed of two receivers with a decoding device. S.E.S.

N79-14143*# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
ACCURACY ANALYSIS OF POINTING CONTROL SYSTEM OF SOLAR POWER STATION Final Report, 23 Jun. - 23 Dec. 1978
J. C. Hung and Peyton Z. Peebles, Jr. 23 Dec. 1978 73 p refs
(Contract NAS8-33065)
(NASA-CR-150880) Avail: NTIS HC A04/MF A01 CSCL 22B

The first-phase effort concentrated on defining the minimum basic functions that the retrodirective array must perform, identifying circuits that are capable of satisfying the basic functions, and looking at some of the error sources in the system and how they affect accuracy. The initial effort also examined three methods for generating torques for mechanical antenna control, performed a rough analysis of the flexible body characteristics of the solar collector, and defined a control system configuration for mechanical pointing control of the array. G.G.

N79-14144# Bendix Corp., Fort Lauderdale, Fla. Avionics Div.
VERY-HIGH-FREQUENCY AEROSAT AIRBORNE TERMINAL Final Report, Apr. 1976 - Mar. 1977
E. O. Kirner, D. Kuntman, and J. Wilson Dec. 1977 101 p refs
(Contract DOT-TSC-1121)
(AD-A053206; FAA-RD-77-156; DOT-TSC-FAA-77-17) Avail: NTIS HC A06/MF A01 CSCL 22/2

This report summarizes the result of a study aimed at defining the airborne VHF terminal for the experimental AEROSAT program. The system consists of a 22-channel VHF transceiver for full-duplex operation. Provisions are made for voice, data, and surveillance modulation. The all-solid-state system develops a power output of 150 watts. The system noise temperature is 1136K.
Author (GRA)

N79-14145# COMSAT General Corp., Washington, D. C.
THE APPLICABILITY OF SATELLITE TECHNOLOGY TO DEFENSE CIVIL PREPAREDNESS Final Report
30 Jun. 1978 96 p

(Contract DCPA01-77-C-0239)
(AD-A060315) Avail: NTIS HC A05/MF A01 CSCL 22/2

This study assesses the applicability of satellite technology to the DCPA mission. Surveys of currently-available and planned communication and remote sensing satellite systems are presented. A section on post-nuclear-blast propagation conditions is included. Conceptual satellite network plans, one based on a dedicated network and one on commercial transponder leasing, are developed, leading to a plan for a preliminary Demonstration Network. The study concludes that a satellite-based Civil Preparedness Communication Network could support both peacetime and disaster-oriented requirements practically; that the use of remote sensing for resource data base inventorying is presently inadvisible; that the 6/4 GHz band offers the best technical and most cost-effective means for initial implementation; and that use of remotely-located Sensor Monitor Terminals to collect and transmit radioactive fallout data to a central processing facility is feasible. Author (GRA)

N79-14146# Ford Aerospace and Communications Corp., Palo Alto, Calif. Western Development Labs. Div.
SATELLITE DATA MANAGEMENT USER TERMINAL INVESTIGATION. VOLUME 1: EXECUTIVE SUMMARY Final Report, Apr. 1977 - May 1978
Jun. 1978 19 p
(Contract F04701-77-C-0094)
(AD-A060052; WDL-TR-7845-Vol-1; SAMSO-TR-78-23) Avail: NTIS HC A02/MF A01 CSCL 09/2

This study surveys, analyzes and defines the critical issues associated with future Satellite Data Management Terminals, looking into the time period to 1990-2000. It takes its principal perspective as that of directly supporting the individual operational or tactical commander in his performance of missions for which satellite data of any sort will be used. The study assumes a broad, explicit mission set and addresses several related questions: What is the nature of the operational/tactical commander who will use the terminal. What are the information handling requirements that result. Inquiry into the state of the art and forecasts of advanced technologies applicable to the terminal lead to conclusions regarding possible terminal configurations. An initial conceptual definition of possible advanced terminal simulation, including characterization of the commander, is included. Indirect measurement parameters for assessing the terminal contribution to command mission decision performance are suggested. Author (GRA)

N79-14147# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
DATA BASE DEVELOPMENT FOR AIR FORCE SATELLITES
Dennis E. Delorey 31 Mar. 1978 72 p Prepared for AFGL
(Contract F19628-76-C-0190)
(AD-A060044; BC-SDAL-78-1; AFGL-TR-78-0076; SR-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

Data bases have been created for the S3-1 satellite and are being created for satellite S3-2. The data processing system developed for these vehicles, the payloads aboard the spacecrafts and the computer software associated with the data processing system are described. Creation and application of the history file for satellite S3-1 are also described. An overview of the SCATHA satellite project is also included. Author (GRA)

N79-14148# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
FORECASTING DEPOT OVERHAUL COSTS OF TACTICAL MISSILE GUIDANCE AND CONTROL SUBSYSTEMS M.S. Thesis
Joel D. Eichenberger and Donald F. Nornille Jun. 1978 96 p refs
(AD-A059567; AFIT-LSSR-9-78A) Avail: NTIS HC A05/MF A01 CSCL 16/4

Recently, increased emphasis has been placed on designing systems for supportability due to the significance of support costs on the total life cycle cost of the system. One of the most important contributors to tactical missile support costs is the cost of depot overhaul of guidance and control subsystems (GCS). Despite its importance, depot overhaul costs are not currently forecast by the operations and support cost model used by Warner Robins Air Logistics Center, the system manager for tactical missiles. Instead, the model requires an externally derived estimate of this cost as input data. However, accurate estimating techniques have not been developed to forecast the cost of tactical missile GCS depot overhaul during system development. The authors, using the technique of multiple linear regression (MLR), identified several physical characteristics of a GCS which are important determinants of depot overhaul cost. These important determinants were then used to develop a cost estimating relationship model for forecasting GCS depot overhaul cost during tactical missile system development. Author (GRA)

N79-14149# Air Force Geophysics Lab., Hanscom AFB, Mass.
DESCRIPTION AND APPLICATION FOR AN AUTOMATED INERTIAL AZIMUTH MEASURING SYSTEM
James A. Shearer and William D. Atwill (Boston Coll., Weston, Mass.) 7 Sep. 1978 11 p refs Presented at AIAA Guidance and Control Conf., Aug. 1978
(AD-A059376; AFGL-TR-78-0210) Avail: NTIS HC A02/MF A01 CSCL 14/2

Requirements for highly precise azimuth references for USAF weapons systems have led to an improved automated azimuth measuring system (AAMS). The AAMS represents the state-of-the-art for a highly accurate, automated, all-weather azimuth capability which can be used in either a laboratory or specialized field environment. The present system consists of two integrated inertial sensors, an angle transfer system, a tiltmeter array and a microprocessor. The inertial sensors use gimbal-mounted rate gyrocompasses to indicate the azimuths of two transfer mirrors with respect to true North. The azimuths are transferred to any number of reflectors by an autocollimator on a precision indexing table. Sight tubes carry low velocity air along each optical path. Highly sensitive tiltmeters are used to measure and correct for errors due to base motions of the inertial sensors. Data handling and functional operation are controlled by the microprocessor. The instrumentation was employed at a Minuteman missile engineering silo to monitor azimuthal motions of the missile. Recent results indicate a standard deviation of 2.1 arc seconds for a single observation. Proposed improvements include refined support electronics, improved measurements of tilts of the gyrocompasses, increased automation and more extensive software for signal processing. Author (GRA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N79-14150# ARO, Inc., Arnold Air Force Station, Tenn.
INFRARED AND PHASE-CHANGE PAINT MEASUREMENTS OF HEAT-TRANSFER ON THE SPACE SHUTTLE ORBITER Final Report
D. W. Stallings and D. B. Carver AEDC Jun. 1978 71 p refs
(AD-A059796; AEDC-TSR-78-V13) Avail: NTIS HC A04/MF A01 CSCL 22/2

These tests were part of a large program to evaluate the effects of aerodynamic heating on the Space Shuttle Orbiter. The MA-29 test was a blockage study conducted to determine the maximum allowable model size for OH-90. The OH-90 test was specifically designed to study boundary layer transition on the lower surface of the orbiter wing. Gaps and steps in the wing insulation material were simulated to determine the effect of such irregularities on the state of the boundary layer. The final test shift of the OH-90 entry was done in support of the Rockwell OH-103 project. An orbiter forebody model was used to obtain detailed heat-transfer rate data on the forward 20 percent of the 140C Space Shuttle Orbiter configuration. GRA

N79-14151*# ARO, Inc., Arnold Air Force Station, Tenn.
HEAT TRANSFER ON THE NASA/ROCKWELL INTERNATIONAL SPACE SHUTTLE ORBITER AT MACH NUMBER 8.0 IN AEDC/VKF TUNNEL B Final Report, 20 Feb.

1978 - 27 Apr. 1978
E. C. Knox Jun. 1978 66 p Sponsored by NASA
(AD-A059497; AEDC-TSR-78-V10) Avail: NTIS HC A04/MF A01 CSCL 22/2

Heat-transfer data were obtained on a 0.0175 scale and on a 0.04 scale model of the NASA/Rockwell International Space Shuttle Orbiter. The data were obtained at Mach 8 in the AEDC/VKF Tunnel B at angles of attack from 25 to 42.5 deg and at several free-stream Reynolds numbers from 500,000 to 3,700,000 per ft. Author (GRA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

No abstracts in this category.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N79-14152*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DESCRIPTION OF THE THREE AXIS LOW-g ACCELEROMETER PACKAGE
A. J. Amalavage, E. H. Fikes, and Eugene H. Berry Nov. 1978 28 p refs
(NASA-TM-78211) Avail: NTIS HC A03/MF A01 CSCL 14B

The three axis low-g accelerometer package designed for use on the Space Processing Application Rocket (SPAR) Program is described. The package consists of the following major sections: (1) three Kearfott model 2412 accelerometers mounted in an orthogonal triad configuration on a temperature controlled, thermally isolated cube, (2) the accelerometer servoelectronics (printed circuit cards PC-6 through PC-12), and (3) the signal conditioner (printed circuit cards PC-15 and PC-16). The measurement range is 0 + or - 0.031 g with a quantization of 1.1 x 10 to the 7th power g. The package was flown successfully on six SPAR launches with the Black Brant booster. These flights provide approximately 300 s of free fall or zero-g environment. Author

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N79-14153*# Hughes Research Labs., Malibu, Calif. Ion Physics Dept.
ADVANCED ELECTROSTATIC ION THRUSTER FOR SPACE PROPULSION Final Report, 21 May 1976 - 21 Jan. 1978
Tommy D. Masek, Duncan MacPherson, Walter Gelon, Seiji Kami, Robert L. Poeschel, and James W. Ward Apr. 1978 400 p ref
(Contract NAS3-20101)
(NASA-CR-159406) Avail: NTIS HC A17/MF A01 CSCL 21C

The suitability of the baseline 30 cm thruster for future space missions was examined. Preliminary design concepts for several advanced thrusters were developed to assess the potential practical difficulties of a new design. Useful methodologies were produced for assessing both planetary and earth orbit missions. Payload performance as a function of propulsion system technology level and cost sensitivity to propulsion system technology level are among the topics assessed. A 50 cm diameter thruster designed to operate with a beam voltage of about 2400 V is suggested to satisfy most of the requirements of future space missions. J.M.S.

N79-14154# Fairchild Industries, Inc., Farmingdale, N.Y. Fairchild-Republic Div.
EXPERIMENTAL AND THEORETICAL ANALYSIS OF PULSED PLASMA EXHAUST PLUMES Final Report, 1 Apr. 1977 - 31 May 1978
Dominic J. Palumbo and Martin Begun 1978 40 p refs
(Contract F49620-77-C-0078; AF Proj. 2308)
(AD-A059488; AFOSR-78-1242TR) Avail: NTIS HC A03/MF A01 CSCL 21/2

Pulsed plasma plume diagnostic studies performed in the past have shown that considerable uncertainty exists because of the degree of backscatter encountered in ground test facilities. The large level of backscatter is attributable to the extremely high mass expulsion rate characteristic of solid propellant pulsed plasma thrusters (30 to 40 g/s on the average). The study reported upon herein had the objective of obtaining a suitable analytic model and computational scheme for calculation of the plume characteristics of a 23 mN-s pulsed plasma thruster. The calculated results were compared to experimental measurements of electron number density and temperature, obtained using specially designed Langmuir probes, only up to the point in the time when backscatter of plume effluents off the vacuum chamber walls became significant. A secondary objective of the program was to design a suitable driver circuit for the Langmuir Sangmuir probes so that a voltage ramp could be pulsed for one microsecond at any given time subsequent to thruster discharge initiation and the volt-ampere characteristic could be displayed on an XY oscilloscope. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N79-14155# Physics International Co., San Leandro, Calif.
INTENSE ELECTRON BEAM GENERATION AND COMPRESSION: ADVANCES IN HIGH-DOSE DIAGNOSTICS AND THEORY Final Report, Mar. 1977 - Nov. 1977
B. Ecker, V. Buck, T. S. T. Young, O. Lopez, and B. Chao Jan. 1978 121 p refs
(Contract DNA001-77-C-0167)
(AD-A059715; AD-E300325; PIFR-1045; DNA-4523F) Avail:

NTIS HC A06/MF A01 CSCL 20/8

Intense electron beam generation and compression in a converging magnetic guide field has been studied experimentally and theoretically. Beams from the OWL II generator with peak parameters of typically 350 kA, 1.2 MeV, and 120 nsec (FWHM of power pulse) have been diagnosed before and after factor-of-three area compression, using a newly constructed multi-collector Faraday cup for current density profile measurements, and a multi-layered or filtered Faraday cup for time-resolved electron angle measurements and time-integrated charge deposition profile measurements. Both diagnostics were successfully used at dose levels up to about 4000 cal/gm. The effect of reflected electrons on diode behavior has been examined and found to be non-negligible for certain target configurations. Experimental results have been used to test the calculations of the REEFER diode code and of the new code, REFLEX, which was developed in this program to evaluate compressed-beam transport according to the Young-Spence model. Author (GRA)

24 COMPOSITE MATERIALS

Includes laminates.

N79-14156* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ELECTRICALLY CONDUCTIVE THERMAL CONTROL COATINGS Patent

Michael Charles Shai, inventor (to NASA) Issued 5 Sep. 1978 5 p Filed 21 Oct. 1977 Supersedes N78-11245 (16 - 02, p 0176)

(NASA-Case-GSC-12207-1; US-Patent-4,111,851; US-Patent-Appl-SN-844344; US-Patent-Class-252-518; US-Patent-Class-106-84; US-Patent-Class-106-296) Avail: US Patent and Trademark Office CSCL 11D

A coating characterized by low thermal absorption, high thermal emittance and high electrical conductivity comprises: (1) a fired oxide pigment comprising a minor amount of aluminum oxide and a major amount of zinc oxide; (2) sufficient water to provide a mixture suitable for application to a substrate, is presented. The fired oxide pigment may further include a minor amount of cobalt oxide. The resulting coating is particularly useful for coating the surfaces of spacecraft and similar objects.

Official Gazette of the U.S. Patent and Trademark Office

N79-14157*# Rensselaer Polytechnic Inst., Troy, N. Y.

COMPOSITE STRUCTURAL MATERIALS Semi-annual Progress Report, Apr. - Sep. 1978

George S. Ansell and Stephen E. Wiberley Dec. 1978 84 p refs Sponsored in part by Air Force Office of Scientific Research

(Grant NGL-33-018-003)

(NASA-CR-158023; SAPR-35) Avail: NTIS HC A05/MF A01 CSCL 11D

The purpose of the RPI composites program is to develop advanced technology in the areas of physical properties, structural concepts and analysis, manufacturing, reliability and life prediction. Concommitant goals are to educate engineers to design and use composite materials as normal or conventional materials. A multifaceted program was instituted to achieve these objectives. Author

N79-14158# Royal Aircraft Establishment, Farnborough (England).

THE DETERMINATION OF THE STABILITY OF STRUCTURES OF COMPOSITE MATERIALS SUBJECTED TO INTENSE SURFACE HEATING

L. G. Belozerov and V. A. Kireen Jun. 1978 9 p refs

(RAE-Lib-Trans-1983; BR64342) Avail: NTIS HC A02/MF A01

The effect of destructive heating applied to the surface of a cylindrical shell of composite material subjected to compressive and loads or uniform external pressure is considered theoretically, and the results compared with those of previously reported experiments by the same authors. The reduction in the value of critical load which occurs with increasing exposure time is considered in terms of the reducing structurally effective thickness of the wall. Author

N79-14159# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.

ELASTIC STABILITY OF GENERALLY LAMINATED COMPOSITE PLATES INCLUDING HYGROTHERMAL EFFECTS Interim Report

Donald L. Flaggs and Jack R. Vinson Jul. 1977 79 p refs (Grant AF-AFOSR-2739-74)

(AD-A059386; MAE-TR-204; AFOSR-78-1349TR) Avail: NTIS HC A05/MF A01 CSCL 11/4

A problem which has become increasingly important with the use of fiber-reinforced polymeric composite material systems in secondary and, more recently, in primary structural applications, is the degradation in performance when exposed to an elevated hygrothermal environment. One aspect of this problem is the reduction in applied loading necessary to buckle a composite structure due to these hygrothermal effects. A general buckling theory is formulated which accounts for the hygrothermal effects due to moisture diffusion and heating on one and both surfaces in addition to transverse shear and normal deformation and the bending-extensional coupling exhibited by generally laminated composite plate. A parametric study is done for a symmetrically laminated, T300/5208 graphite-epoxy plate with both simply supported and clamped boundary conditions for steady state and transient hygrothermal conditions to show the deleterious effects of an elevated hygrothermal environment on a laminated composite structure. Additionally, for typical laminates of GY70/339 graphite-epoxy with clamped boundary conditions at elevated hygrothermal conditions, it is shown that inclusion of transverse shear and normal deformation is necessary for certain a/b and a/h aspect rations. Author (GRA)

N79-14160# Physics International Co., San Leandro, Calif.

ELECTRON BEAM CONDITIONING OF CARBON PHENOLIC ABLATOR SURFACE Final Report, Mar. - Dec. 1977

K. Triebes, C. Stallings, and J. Shea Jun. 1978 43 p refs (Contract DNA001-77-C-0193; DNA Proj. NWED-QAXAA112)

(AD-A059941; AD-E300342; PIFR-1050; DNA-4522F) Avail: NTIS HC A03/MF A01 CSCL 07/1

Hardware and techniques have been demonstrated that allow controlled depths of phenolic removal from a tape-wrap carbon phenolic ablator material using a pulsed electron beam. Phenolic removal depths ranged from 5 mm to 15 mm with good uniformity over the sample area. Calculations based on the above experimental results indicate that with an optimized system, single pulse irradiation areas of up to 1000 sq cm are possible on the Physics International OWL II generator. Author (GRA)

N79-14161# Northwestern Univ., Evanston, Ill.

DYNAMICS OF COMPOSITE MATERIALS Final Technical Report, 1 Apr. 1972 - 30 Jun. 1978

S. Nemat-Nasser Jul. 1978 8 p refs

(Grants DA-ARO(D)-31-124-72-G-146; DAHC04-75-G-059; DAAG29-76-G-0063; DAAG29-77-G-0034)

(AD-A060006; ARO-10578.7-E; ARO-12489.9-E) Avail: NTIS HC A02/MF A01 CSCL 11/4

In this project attention has been focused on: (1) The accurate calculation of the dispersive properties of laminated and two- and three-dimensional fiber-reinforced elastic composites; (2) The accurate determination of natural frequencies of composite plates and beams, or plates and beams with variable dimensions or with inclusions; (3) Calculation of upper and lower bounds for the eigenfrequencies in (1) and (2); and (4) The assessment of the effect of fiber geometry on the dynamic properties of the fiber-reinforced composite. Author (GRA)

N79-14162# Texas A&M Univ., College Station. Mechanics and Materials Research Center.

STUDIES ON THE MECHANICAL RESPONSE AND FRACTURE OF VISCOELASTIC COMPOSITE MATERIALS Final Report, 1 Jun. 1974 - 31 May 1978

R. A. Schapery and J. H. Schmidt, Jr. Jul. 1978 143 p refs (Grant AF-AFOSR-2697-74)

(AD-A059526; MM-3064-78-6) Avail: NTIS HC A07/MF A01 CSCL 11/4

This final report describes research activities conducted during the course of the grant. They were concerned generally with the analysis of cracks in particulate and fibrous viscoelastic media and the effect of cracks on the mechanical behavior of composites. The work is presented in five sections: (1) Elastostatic Fields in a Crack Tip Neighborhood-Measurements and Uniqueness; (2) On the Mechanical Behavior of Solid Propellant under Transient Temperatures; (3) Some Viscoelastic Crack Growth Relations for Orthotropic and Prestrained Media; (4) A theory of Time-Dependent Bonding for Viscoelastic Media; and (5) A method for Predicting Crack Growth in nonhomogeneous Viscoelastic Media. Only abstracts and conclusions are given in the last three sections as the studies were previously published in separate reports. Author (GRA)

N79-14163# Technion - Israel Inst. of Tech., Haifa. Material Mechanics Lab.

DYNAMIC INELASTIC BEHAVIOR OF MATERIALS Final Report, 1 Dec. 1973 - 31 May 1978

Sol R. Bodner Jul. 1978 24 p refs
(Grant AF-AFOSR-2607-74)
(AD-A059514; MML-63; AFOSR-78-1290TR;
ISSN-0072-9310) Avail: NTIS HC A02/MF A01 CSCL 11/4

The main subject of the research program was the further development of elastic-viscoplastic constitutive equations to represent a wide range of material behavior and loading conditions and application of the equations to static and dynamic structural problems. Associated investigations included generalization of the constitutive equations to multiaxial stress states and studies on anelastic materials. Other topics in the program were investigations of ballistic penetration single target plates under oblique impact and of multi-layered targets subject to normal impact, impact strength of composites, and acoustic emission of composites. The accomplishments of the program are discussed and proposed directions of future research are indicated. GRA

N79-14164# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.

ON THE STATE OF TECHNOLOGY REGARDING THE USE OF MECHANICAL FASTENERS IN COMPOSITE MATERIAL STRUCTURES Interim Report

Jack R. Vinson Jul. 1978 37 p refs
(Grant AF-AFOSR-2739-74)
(AD-A059485; MAE-TR-214; AFOSR-78-1278TR) Avail: NTIS HC A03/MF A01 CSCL 11/4

It is generally agreed that composite materials today offer many advantages over the use of metallic structures in many applications because of (1) their superior strength to density ratios and stiffness to density ratios which result in weight savings ranging from 20 percent to 40 percent in most aerospace applications, to 50 percent and more in some automotive applications, and (2) far fewer structural components are required. Nevertheless, structural components of composite materials must be joined together in some manner, and the joining introduces problems of a particular and unique nature. First of all, polymer matrix composite materials are limited to adhesive bonding and mechanical fastening because welding of all kinds, brazing, soldering etc. are not possible. Secondly, almost all engineers agree that philosophically adhesive bonding is superior to mechanical fastening, primarily because fibers are not cut. But for those components that must be removable for any purpose, adhesive bonding must be substituted for by discrete mechanical fasteners, and the problems that arise are uniquely complicated. In this case fibers are cut, causing local weakening, complicated by the response of each ply with its particular orientation, the possibility of delamination, uncertainty of the failure criterion, etc. This report attempts to present the state of the technology in July 1978, to show what is known and understood, what needs to be studied, and what is required to design a bolted joint in composite materials. Author (GRA)

N79-14165# California Univ., Livermore. Lawrence Livermore Lab.

COMPARATIVE PROPERTIES OF FIBER COMPOSITES FOR ENERGY-STORAGE FLYWHEELS PART A. EVALUATION OF FIBERS FOR FLYWHEEL ROTORS

Lynn S. Penn 21 Oct. 1977 7 p
(Contract W-7405-eng-48)
(UCRL-80116-Pt-A; Conf-771053-10) Avail: NTIS HC A02/MF A01

Four fiber-composite systems (Kevlar 49/epoxy, Kevlar 29/epoxy, S2-glass/epoxy, and E-glass/epoxy) were studied for use in flywheel rotors. The performance of the materials, was compared as well as the relationship of the results of conventional tests (e.g., NOL ring hydroburst) to the results of flywheel rotor spin tests. The relatively inexpensive hydroburst test yielded failure stress results statistically identical to those obtained from the costly spin tests. Thus, at a given fiber volume, NOL ring burst data can be used to predict rotor performance. A comparison of materials performance revealed that in terms of energy storage potential, the Kevlar 49/epoxy composite ranks highest, but in terms of energy storage per unit cost, E-glass/epoxy is best. DOE

N79-14166# California Univ., Livermore. Lawrence Livermore Lab.

PROBLEMS IN TESTING ARAMID/EPOXY COMPOSITES

Linda L. Clements 4 Nov. 1977 10 p refs Presented at Conf. on Failure Modes and Processing of Composites 4, Chicago, 24-27 Oct. 1977; sponsored by the Met. Soc. of AIME and the Am. Soc. of Metals
(Contract W-7405-eng-48)
(UCRL-79450; Conf-771066-2) Avail: NTIS HC A02/MF A01

Although material fabrication, especially by such techniques as filament winding, generally is as easy or easier for an aramid fiber as for graphite or glass fibers, the problems in specimen preparation and testing frequently are much greater. In some cases, these problems result from the desirable properties of the fiber. For instance, the toughness of the fiber reduces damage during processing but complicates specimen preparation because it is very difficult to cut across the fibers of the composite. Other problems as well are specific to the aramid fiber. Specimens tend to be very susceptible to damage due to bending, twisting, or misalignment. Failure modes often are difficult to understand, and undesirable failure modes may be difficult to eliminate. The various problems are surveyed and special techniques for working with aramid/epoxy composites are explained. Some of the as-yet unresolved difficulties also are discussed. DOE

N79-14167# California Univ., Livermore. Lawrence Livermore Lab.

STRESS RUPTURE LIFE AND STRENGTH RETENTION OF AN ARAMID FIBER/EPOXY COMPOSITE UNDER ACCELERATING CONDITIONS

Lynn S. Penn and R. J. Sherry 10 Nov. 1977 9 p refs Presented at Conf. on Failure Modes and Processing of Composites 4, Chicago, 24-27 Oct. 1977; sponsored by the Met. Soc. of AIME and the Am. Soc. of Metals
(Contract W-7405-eng-48)
(UCRL-79449; Conf-771066-3) Avail: NTIS HC A02/MF A01

The long term tensile strength retention of Kevlar 49 epoxy composite under sustained loading at 56.4 percent of the ultimate fiber tensile strength (3400 MPa) was investigated. The lifetime to failure of the composite under the same load level was also determined. To obtain data in a conveniently short time, elevated temperature was used according to an acceleration relation (Arrhenius type) developed for the Kevlar 49 composite. Although the acceleration relation gave a calculated stress-rupture lifetime of 526 h, the actual median lifetime was 272 h. The strength retention tests indicate that at 110 C stress (sustained loading) it does cause a small but statistically significant loss of strength (8 percent) by 200 h. Heat alone (no stress) degrades the strength only after 500 h have elapsed, and then only a small amount. Exposure to ultraviolet light similar to room light for 500 h at 110 C does not have any additional degrading effect. DOE

N79-14168# California Univ., Livermore. Lawrence Livermore Lab.

ENERGY AND TECHNOLOGY REVIEW, JUNE 1978

Henry D. Shay, ed., Patricia L. Lien, ed., Judyth K. Prono, ed., and Jane T. Staehle, ed. Jun. 1978 35 p refs
(Contract W-7405-eng-48)
(UCRL-52000-78-6) Avail: NTIS HC A03/MF A01

A yield of 7.3 x 10 to the 9th power neutrons and a 6 keV ion temperature was recorded for Shiva's first 20 beam shot on target. The laser delivered a record 26TW in less than 0.1 ns. The development of lightweight fiber composite materials for various applications is discussed with emphasis on their use in energy storage flywheels. Methods for preheating the rubble bed with hot inert gas as a startup means for controlled combustion retorting of oil shale are examined as well as efforts to improve and update the technical basis for assessing seismic safety at nuclear power facilities. A.R.H.

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also 77 *Thermodynamics and Statistical Physics.*

N79-14169* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MICROELECTROPHORETIC APPARATUS AND PROCESS Patent

Benjamin W. Grunbaum, inventor (to NASA) (Calif. Univ., Berkeley) Issued 19 Dec. 1978 14 p Filed 10 Nov. 1977 Supersedes N78-11216 (16 - 02, p 0172) Sponsored by NASA (NASA-Case-ARC-11121-1; US-Patent-4,130,471; US-Patent-Appl-SN-850507; US-Patent-Class-204/180G; US-Patent-Class-204-180S; US-Patent-Class-204-299R; US-Patent-Class-23-230B; US-Patent-Class-424-12) Avail: US Patent and Trademark Office CSCL 07D

New gel tray and lid assemblies designed for use in conjunction with slotted electrophoretic membranes were developed to take advantage of recently improved microelectrophoretic accessories which include a multisample applicator capable of applying up to 10 samples consecutively or simultaneously, and a temperature control plate for dissipating the heat produced by electrophoresis in a gel. The trays and membranes can be marketed ready for use as electrophoretic media or impregnated with various specific substrates and dyes

Official Gazette of the U.S. Patent and Trademark Office

N79-14170 Engineering Sciences Data Unit, London (England).

THERMAL CONDUCTIVITY OF LIQUID ALIPHATIC AMINES

Sep. 1978 10 p

(ESDU-78022; ISBN-0-85679-224-1) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161 HC $194.50

Values of thermal conductivity at saturation pressure, in tabular form, for the liquid aliphatic amines which are members of the following groups: alkyl amines, dialkyl amines, and trialkyl amines are presented. The data on which these recommended values of thermal conductivity are based are the most reliable available and the range covered is from the melting point to approximately 0.9 of the critical temperature. Quantities are expressed in SI Units and conversion factors to other units are provided. The procedure used to obtain the values of thermal conductivity is presented and the effect of pressure is indicated. ESDU

N79-14171*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

PROCESS FOR PREPARATION OF LARGE-PARTICLE SIZE MONODISPERSE LATEXES Patent Application

John W. Vanderhoff (Lehigh Univ., Bethlehem, Pa.), Fortunate J. Micale (Lehigh Univ., Bethlehem, Pa.), Mohammed S. Ed-Aasser (Lehigh Univ., Bethlehem, Pa.), and Dale M. Kornfeld, inventors (to NASA) Filed 29 Dec. 1978 14 p

(NASA-Case-MFS-25000-1; US-Patent-Appl-SN-974474) Avail: NTIS HC A02/MF A01 CSCL 07D

Monodisperse latexes having a particle size over 2 microns are prepared by seeded emulsion polymerization in microgravity. A reaction mixture containing smaller monodisperse latex seed particles, and predetermined amounts of monomer, emulsifier, initiator, inhibitor and water is placed in the microgravity environment of outer space, and polymerization is initiated by heating. The reaction is continued under mild agitation until the seed particles grow to a predetermined size, and the resulting enlarged particles are recovere. Novelty of the invention resides in the use of a microgravity environment to exceed the previous maximum attainable particle size. The use of a closed, expandible reaction vessel and specific combinations of reactants and reaction conditions may also be novel. NASA

N79-14172*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

METHOD OF CROSS-LINKING POLYVINYL ALCOHOL AND OTHER WATER SOLUBLE RESINS Patent Application

D. W. Sheibley, W. H. Philipp, and L. C. Hsu, inventors (to NASA) Filed 20 Dec. 1978 13 p

(NASA-Case-LEW-13103-1; US-Patent-Appl-SN-971596) Avail: NTIS HC A02/MF A01 CSCL 07D

A self-supporting sheet structure comprising a water soluble, non-cross-linked polymer, such as polyvinyl alcohol, is reported which is capable of being cross-linked by reaction with hydrogen atom radicals and hydroxyl molecule radicals in an aqueous solution having a pH of less than 8 and containing a dissolved salt in an amount sufficient to prevent dissolution of the non-cross-linked polymer. The aqueous solution is then irradiated with ionizing radiation to form hydrogen atom radicals and hydroxyl molecule radicals. The irradiation is continued for a time sufficient to produce a water-insoluble polymer sheet structure. The method has particular application in the production of battery separators and electrode envelopes for alkaline batteries. NASA

N79-14173*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CROSS-LINKED POLYVINYL ALCOHOL AND METHOD OF MAKING SAME Patent Application

Li-Chen Hsu, Dean W. Heibley, and Warren H. Philipp, inventors (to NASA) Filed 20 Dec. 1978 12 p

(NASA-Case-LEW-13101-1; US-Patent-Appl-SN-971473) Avail: NTIS HC A02/MF A01 CSCL 07D

A polyvinyl alcohol battery separator is described which has good tensile strength, good resistance to conditions prevailing in alkaline batteries, and an electrical resistivity of less than 1 ohm/sq cm. The product is made by admixing polyvinyl alcohol, preferably in the form of a readily available aqueous solution, and a polyaldehyde-polysaccharide such as inexpensive, readily available polydialdehyde starch. The admixture is formed into a sheet by casting an aqueous admixture of the resin and the cross-linking agent. The dried sheet or film is cut to size if desired and may be assembled into bag form for use in a battery. Cross-linking is effected by contacting the film, with a conventional aqueous acid catalyst solution, in an amount sufficient to prevent dissolution of the polymer in the aqueous acid solution. NASA

N79-14174*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

IN-SITU CROSS-LINKING OF POLYVINYL ALCOHOL Patent Application

W. H. Philipp, L. C. Hsu, and D. W. Sheibley, inventors (to NASA) Filed 20 Dec. 1978 13 p

(NASA-Case-LEW-13135-1; US-Patent-Appl-SN-971475) Avail: NTIS HC A02/MF A01 CSCL 07D

Precise control of crosslinking in the preparation of polyvinyl alcohol battery separators is achieved by incorporating the crosslinking agent in the polyvinyl alcohol and then effecting crosslinking after the polymer is shaped or fabricated into a useful configuration. Aqueous polyvinyl alcohol is admixed with an aqueous dialdehyde crosslinking agent. The pH of the solution is preferably alkaline to prevent premature crosslinking reaction. The aqueous admixture is cast into a sheet and dried to form a self-supporting film which is then immersed in an aqueous acid catalyst solution containing a dissolved salt in an amount sufficient to inhibit dissolution of the noncrosslinked polymer. The resultant crosslinked film has excellent properties, such as low electrical resistivity, rendering the film suitable for use as a separator for an alkaline battery. NASA

N79-14175*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
ADSORPTION OF HYDROGEN CHLORIDE ON MICROCRYSTALLINE SILICA Final Report
Yoonok Kang and James P. Wightman Jan. 1979 94 p refs (Grant NsG-1389)
(NASA-CR-158018) Avail: NTIS HC A05/MF A01 CSCL 07D

The interaction of hydrogen chloride with quartz was studied to determine the extent to which silica can irreversibly remove hydrogen chloride from the atmosphere. Adsorption isotherms were measured at 30 C for hydrogen chloride on silica outgassed between 100 C and 400 C. Readsorption isotherms were also measured. The silica surface was characterized further by infrared spectroscopy, electron spectroscopy for chemical analysis, scanning electron microscopy, and immersional calorimetry. Ground debris samples obtained from the Kennedy Space Center, were likewise examined. A.R.H.

N79-14176# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
ELECTROCHEMISTRY OF MOLTEN DIMETHYLSULFONE: OXIDATION-REDUCTION SYSTEMS OF COPPER AND ITS IONS IN THE PRESENCE OF HALIDE IONS
M. Machtinger, M. J. Vuaille, and B. Tremillon 1978 18 p refs Transl. into ENGLISH from J. Electroanal. Chem. (Netherlands), no. 83, 1977 p 273-286
(CSIR-Trans-1409) Avail: NTIS HC A02/MF A01

Research shows the potential of molten dimethylsulfone (CH3) 2502 as a solvent. This is a compound which melts at 108-109C, boils at 240C and is chemically inert. After a systematic electrochemical study of the different complexes formed between copper ions and halide anions, the catalyzing effect of the Cu(1)/Cu(2) system and the possibilities of variation were considered. Two examples of oxidation reactions with oxygen, with catalysis by copper ions, are discussed. G.Y.

N79-14177*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A HIGH-PRESSURE PREMIXED FLAT-FLAME BURNER FOR CHEMICAL PROCESS STUDIES
Irvin M. Miller Dec. 1978 31 p refs
(NASA-TP-1318; L-12347) Avail: NTIS HC A03/MF A01 CSCL 21B

A premixed flat-flame burner was designed and tested with methane-air mixtures at pressures from 1.1 to 20 atm and equivalence ratios from 0.7 to 1.1. Reactant velocity in the burner mixing chamber was used to characterize the range of stable flames at each pressure-equivalence-ratio condition. Color photographs of the flames were used to determine flame zone thickness and flame height. The results show that this burner can be used for chemical process studies in premixed high pressure methane-air flames up to 20 atm. Author

N79-14178# General Electric Co., Santa Barbara, Calif. DASIAC.
REACTION RATE DATA, NUMBER 64
Apr. 1978 19 p refs
(Contract DNA001-75-C-0023)
(AD-A059482) Avail: NTIS HC A02/MF A01 CSCL 07/4

Progress is reported in the following areas: reaction rates essential to propagation; theoretical investigations of ionizing mechanisms in the upper atmosphere; atomic and molecular physics; and IR phenomenology and optical data base. J.M.S.

N79-14179# Naval Academy, Annapolis, Md. Energy-Environment Study Group.
POLAROGRAPHY OF RDX HYDROLYSIS PRODUCTS IN EFFLUENT OF ION EXCHANGE COLUMN TREATMENT OF RDX WATER Final Report, 1 Jul. 1976 - 31 Aug. 1976
John V. Prestia 30 Jun. 1977 11 p refs
(AD-A059710; USNA-EPRD-40) Avail: NTIS HC A02/MF A01 CSCL 13/2

RDX in water solution can be measured directly by Rapid Scan Single Sweep Polarography. The lower limit of detection is about 0.5 ppm. Author (GRA)

N79-14180# California Univ., Berkeley. Dept. of Mechanical Engineering.
LASER INDUCED FLUORESCENCE SPECTROSCOPY FOR MAKING IN-SITU SPECIES CONCENTRATION MEASUREMENTS IN TURBULENT COMBUSTION FLOWS Annual Report
John W. Daily Aug. 1978 40 p refs
(Grant AF-AFOSR-3357-77; AF Proj. 2308)
(AD-A059399; AFOSR-78-1289TR) Avail: NTIS HC A03/MF A01 CSCL 21/2

The major portion of the year was spent in preliminary work with sodium. The method of saturated laser induced fluorescence spectroscopy was demonstrated for sodium and a number for problem areas were delineated and accounted. Decay experiments were conducted to back out chemical decay rates for excited state sodium. For atomic species an alternative to fluorescence spectroscopy is near resonant Rayleigh or Raman scattering for measuring species concentrations. Experiments have been performed with sodium which show not only the feasibility of the techniques, but show that it may be extended to much higher number densities than fluorescence because of reduced trapping. Work was started on OH. A number of fluorescence and fluorescence excitation spectra were generated which will be used to develop pumping strategies. GRA

N79-14181# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mathematics and Statistics.
BAYES EQUIVARIANT ESTIMATORS OF THE VARIANCE OF A FINITE POPULATION FOR EXPONENTIAL PRIORS
S. Zacks 15 Sep. 1978 14 p refs
(Contract N00014-75-C-0529)
(AD-A059499; TR-33) Avail: NTIS HC A02/MF A01 CSCL 07/4

The present paper presents the derivation of the Bayes equivariant estimator of the variance of a finite population for prior i.i.d. exponential random variables and quadratic loss. The forms of the Bayes equivariant estimator strongly depends on the prior distribution assumed. In a previous paper the form of the Bayes equivariant estimator was derived for normal i.i.d. ranpom variables. This model yields a relatively simple result. The present paper is therefore devoted to the study of the form of the estimator when the prior distribution is considerably different from a normal distribution. Numerical illustrations are provided too. Author (GRA)

N79-14182# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DEVELOPMENT AND EVALUATION OF A COLUMNAR ION EXCHANGE SYSTEM USING MICROENCAPSULATED MAGNETIC RESIN Ph.D. Thesis
Anthony Michael Wachinski Aug. 1978 69 p refs
(AD-A059894; AFIT-CI-78-114) Avail: NTIS HC A04/MF A01 CSCL 07/1

A unique method using 15-20 micron diameter magnetic ion exchange resin in columnar operation was demonstrated. A barium ferrite powder 2 microns in diameter was encapsulated within an experimental synthetic strong-acid ion exchange resin, sulfonated, and magnetized using a laboratory magnet of 15,000 Gauss. A procedure was developed whereby the magnetized resin was allowed to attach itself to a stainless steel wool matrix, which loosely filled the column. By maintaining a high void volume throughout the bed, pressure drop was maintained at acceptable values. Performance of the system was evaluated by monitoring variations in breakthrough capacity, as regeneration flow rates and contact times, and softening flow rates and contact times were varied. Sodium chloride was used to regenerate the column in an upflow mode, countercurrent to the service cycle. The ion exchange System evolved in these studies is the first known system to utilize fine mesh ion exchange resin in columnar operation and take advantage of the superior properties made possible by small diameter resin. GRA

N79-14183# Northern Research and Engineering Corp., Cambridge, Mass.
FLAMEHOLDER COMBUSTION INSTABILITY STUDY. VOLUME 1: ANALYTICAL CONSIDERATIONS Final Report, May 1976 - Jan. 1978

W. Jansen, M. Platt, and G. E. Smith May 1978 187 p refs (Contract F33615-76-C-2112)
(AD-A060073; NREC-1294-1; AFAPL-TR-78-27-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 21/2

Rumble is characterized as a combination of stable and unstable longitudinal acoustic modes that interact with each other while exchanging energy. The final result is a system oscillation of finite amplitude with a frequency that bears no relation to the acoustic frequency, but occurs at a level somewhere among those of the modes under consideration. The present work involves a non-linear theory which allows for the inclusion of rumble-related phenomena that a linear theory cannot handle while using a combustion model previously derived in linear stability work. The final equations have been programmed for use in a digital computer. The use of the computer program is explained in this document, and illustrations with sample input and output are given. Author (GRA)

N79-14184# Louisiana State Univ. and A&M Coll., Baton Rouge. Div. of Engineering Research.
COMBUSTION KINETICS OF SELECTED AROMATIC HYDROCARBONS Interim Report, 1 Jun. 1977 - 31 May 1978
Richard A. Matula and Richard C. Farmer Jun. 1978 30 p refs
(Grant AF-AFOSR-3384-77)
(AD-A059381; AFOSR-78-1294TR) Avail: NTIS HC A03/MF A01 CSCL 07/3

The primary objective of the research program is to develop an understanding of the high temperature pyrolysis, oxidation and carbon formation processes in selected aromatic-hydrocarbon/air-combustion systems. The results of this study can be subsequently utilized to optimize the use of high-aromatic-content synthetic jet-fuels in both present and future jet combustors. Specific objectives of the research are to: study the kinetics of aromatic hydrocarbon pyrolysis in temperature and ranges of interest; study the ignition and oxidation of aromatic hydrocarbon-air systems; measure the critical fuel-oxidizer equivalence ratio for incipient soot formation in aromatic hydrocarbon-air mixtures; and develop quasi-global and/or detailed oxidation mechanisms for these aromatic hydro-carbons based on experimental data and computer modeling of the reaction systems. Author (GRA)

N79-14185# Georgia Inst. of Tech., Atlanta. Energy and Environmental Analysis Div.
THE KINETICS AND SPECTROSCOPY OF AIRCRAFT AND ROCKET PLUME CONSTITUENTS Interim Report, 1 Jun. 1977 - 31 May 1978
F. P. Tully and A. R. Ravishankara 31 Jul. 1978 29 p refs (Contract F49620-77-C-0111; AF Proj. 2308)
(AD-A059809; AFOSR-78-1280TR; PR-1) Avail: NTIS HC A03/MF A01 CSCL 21/2

Utilizing the technique of flash photolysis-resonance fluorescence the rate constants for the reactions of hydroxyl radicals (OH) with methane and carbon monoxide have been measured up to 825 K. Curvatures have been observed in the Arrhenius plots for both reactions. The measured rate constants have been compared with the previous measurements reported in the literature. Oxidation of BF3 and BCl3 by both O2 and O3 have been studied. The rate of oxidation of these haloboranes by O2 is negligibly small. O3 oxidizes BCl3 (but not BF3) at a measurable rate. GRA

N79-14186# Illinois Univ., Urbana. Dept. of Physics.
LUMINESCENT DECAY AND SPECTRA OF IMPURITY-ACTIVATED ALKALI HALIDES UNDER HIGH PRESSURE Ph.D. Thesis
David Ira Klick 1977 205 p refs Sponsored by DOE
(COO-1198-1187) Avail: NTIS HC A10/MF A01

The effect of high pressure on the luminescence of alkali halides doped with the transition-metal ions Cu(+) and Ag(+) and the heavy-metal ions In(+) and Tl(+) was investigated to 140 kbar. Measurement of spectra allowed the prediction of kinetic properties, and the predictions agree with lifetime data. In view of the localized nature of electronic transitions, a pressure-dependent single configuration coordinate model was used to interpret the luminescence data. While pressure affects the volume, it also coupled to the nontotally symmetric coordinates that determine the lifetime in the phosphors studied. Luminescent kinetics were governed by the assistance of odd phonons for Cu(+) and Ag(+), and by Jahn-Teller distortions for In(+) and Tl(+). DOE

N79-14187# Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
ION SELECTIVE ELECTRODES IN WATER QUALITY ANALYSIS Final Report
Robert C. Thurnau May 1978 44 p refs
(PB-285724/1; EPA-600/2-78-106) Avail: NTIS HC A03/MF A01 CSCL 07D

The maintenance of water quality whether at the treatment plant or out in the distribution system is predicated on accurately knowing the condition of the water at any particular momemt. Ion selective electrodes showed tremendous potential in the area of continuous water quality analysis. Alkalinity, calcium, chloride, fluoride, hardness, nitrate, and pH were monitored. The pH and the chloride electrodes were housed in a commercial unit and linked to the computer with a minimum number of operating problems. Data are presented as to the reliability and accuracy of the electrodes. GRA

N79-14188# Fein-Marquart Associates, Inc., Baltimore, Md.
APPROACHES FOR THE ACQUISITION OF MASS SPECTRAL DATA FOR INCLUSION IN THE NIH/EPA/MSDC MASS SPECTRAL DATA BASE Final Report, 31 Oct. 1977 - 31 Mar. 1978
D. P. Martinsen Mar. 1978 33 p refs
(Grant NSF AEN-77-19673)
(PB-285868/6; FMA-375; NSF/RA-780242) Avail: NTIS HC A03/MF A01 CSCL 07D

Ways in which mass spectral data, particularly that being generated with the support of government funds could be made available for addition to the mass spectral data base were investigated. Contacting the producers directly was found to be the most fruitful method to acquire spectra. Possible means of locating the producers are discussed. Trying to establish policies governing the reporting of data under government research grants seems an almost impossible task. Obtaining spectra directly from the primary journals is not worthwhile in most cases; however, the journals do seem to be a good source of the identity of the producers of mass spectra. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N79-14189 Engineering Sciences Data Unit, London (England).
FATIGUE OF WROUGHT TITANIUM ALLOYS Ti6Al-6V-2Sn AND Ti-4Al-4Mo-2Sn-0.5Si
Jun. 1978 13 p
(ESDU-78014; ISBN-0-85679-215-2) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn.: ESDU, Springfield, Va. 22161 HC $290.50

Constant amplitude data on the fatigue strength of wrought titanium alloys are presented, in both plain and notched specimen form. The fatigue strength of these alloys is affected by the microstructure which is largely dependent upon the degree of working and heat treatment of the original bar, forging or plate. ESDU

N79-14190# Nottingham Univ. (England). Dept. of Inorganic Chemistry.
HDA CORROSION CHEMISTRY Final Scientific Report, 1 May 1974 - 30 Apr. 1976
Cyril Clifford Addison and Norman Logan Dec. 1977 362 p refs
(Grant AF-AFOSR-2709-74)
(AD-A052141; AFOSR-74-2709TR; AFRPL-TR-77-65) Avail: NTIS HC A16/MF A01 CSCL 11/6

An experimental procedure for the detection of phase separation in HNO3 N2O4 mixtures by electrical conductivity measurements was developed. This method was also used to investigate the influence of Fe(NO3)3.1.5N2O4 and KNO3 on

the two-phase boundary of the HNO3 - N2O4 phase diagram in the acid-rich region. The two-phase boundary is not greatly influenced by these additives. G.G.

N79-14191*# National Aeronautics and Space Administration, Washington, D. C.
HYDROGEN ABSORPTION IN SOLID ALUMINUM DURING HIGH-TEMPERATURE STEAM OXIDATION
L. A. Andreev, B. G. Gelman, and A. A. Zhukhovitskiy Jan. 1979 11 p refs Transl. into ENGLISH from Fiz.-Khim. Issled. Met. Protsessov (USSR), v. 1, 1973 p 90-94 Original language document was announced as A78-42949 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Moscow Inst. of Steel and Alloys
(Contract NASw-3199)
(NASA-TM-75360) Avail: NTIS HC A02/MF A01 CSCL 11F

Hydrogen is emitted by aluminum heated in a vacuum after high-temperature steam treatment. Wire samples are tested for this effect, showing dependence on surface area. Two different mechanisms of absorption are inferred, and reactions deduced. Author

N79-14192*# Massachusetts Inst. of Tech., Cambridge.
PRESENT STATUS OF GaAs
H. C. Gatos, J. Lagowski, and L. Jastrzebski Jan. 1979 32 p
(Grant NsG-7331)
(NASA-CR-3093) Avail: NTIS HC A03/MF A01 CSCL 11F

An extensive literature survey on GaAs was carried out for the period December 31, 1970, to December 31, 1977. The increasing interest in GaAs device structures increased steadily during that period. The leading research and development centers and the specific areas of interest were identified. A workshop on GaAs was held in November 1977 to assess the present status of melt-grown GaAs and the existing needs for reliable chemical, structural, and electronic characterization methods. It was concluded that the present available bulk GaAs crystals are of poor quality and that GaAs technology is lagging demonstrated or potentially feasible GaAs devices and systems. Author

N79-14193# Aeronautical Research Labs., Melbourne (Australia).
MECHANISMS OF HYDROGEN EMBRITTLEMENT: CRACK GROWTH IN A LOW-ALLOY ULTRA-HIGH-STRENGTH STEEL UNDER CYCLIC AND SUSTAINED STRESSES IN A GASEOUS HYDROGEN
S. P. Lynch and N. E. Ryan May 1978 18 p refs
(ARL/MAT-103; AR-001-273) Avail: NTIS HC A02/MF A01

Rates of crack growth in a low-alloy ultra-high-strength steel (D6aC) under cyclic and sustained stresses were measured as functions of stress-intensity, for different cyclic wave-forms and frequencies, in low pressure (13.3 kPa) hydrogen, dry air, and vacuum(.001 Pa) environments; sustained-load cracking in liquid mercury was also studied. Frequency and wave-form had large effects on rates of fatigue-crack growth in hydrogen but little influence on fatigue in air and vacuum. For triangular wave-forms, rates of crack growth in hydrogen were determined by the stress-intensity range and the load-rise time. Many similarities between hydrogen-embrittlement and liquid-metal embrittlement (e.g. surfaces of the intercrystalline fractures induced by hydrogen and mercury were sometimes indistinguishable) suggest that the mechanism of embrittlement is basically the same in both cases. It is considered that previous explanations for embrittlement are not consistent with the present fractographic observations (e.g., dimpled transcrystalline fractures were sometimes observed after crack growth in mercury and hydrogen). The present results suggest that the effects of hydrogen and liquid-metal environments on crack growth can generally be explained on the basis that chemisorption influences interatomic bonds/spacings at surfaces (crack tips) and thereby facilitates nucleation of dislocations at crack tips. Some aspects of hydrogen embrittlement are discussed in terms of the proposed model. F.O.S.

N79-14194# Illinois Univ. at Urbana-Champaign, Urbana.
APPLICATION OF RAPID SOLIDIFICATION TECHNIQUES TO ALUMINUM ALLOYS Progress Report
R. Mehrabian Aug. 1978 31 p refs
(Contract N00014-78-C-0275; ARPA Order 3517)
(AD-A059518) Avail: NTIS HC A03/MF A01 CSCL 11/6

This program is being conducted for the purpose of developing a predictive model of heat flow and solidification for aluminum alloys produced under the high cooling rate conditions achievable in rotary atomization and laser surface melting. It is a combined experimental and theoretical study of the relationship between the important solidification variables (e.g. cooling rate, temperature gradients, interface shape and velocity, super-cooling and transformation kinetics) and the structure and microchemistry of rapidly solidified aluminum alloys. Author (GRA)

N79-14195# Southwest Research Inst., San Antonio, Tex.
THE EFFECT OF STRAIN RATE ON THE TOUGHNESS OF SHIP STEELS Final Technical Report
P. H. Francis, T. S. Cook, and A. Nagy Apr. 1978 80 p refs
(Contract N00024-75-C-4284)
(AD-A059453; SSC-275) Avail: NTIS HC A05/MF A01 CSCL 11/6

Yield strength and fracture toughness, as measured by the dynamic tear test, were determined as a function of load rate and temperature for several ship primary structure steels in strength ranges up to 100 ksi. The materials used were ABS-B, DS, AH-32, EH-32, CS, A517-D, A678-C, and A537-B, in one or two heats each. The effect of notch geometry, i.e., fatigue precracked vis-a-vis pressed notch, was investigated in some of the tests. By fully instrumenting some of the tests, the energy to maximum load as well as the total energy to failure was determined. Based on these energies, the resistance of the materials to crack initiation and to propagation could be examined. The results indicate potentially different fracture behavior between the high and low strength alloys. This in turn has implications in terms of the Ship Structure Committee Report SSC-244 proposed fracture criterion for qualifying toughness and crack arrest properties of ship steels and weldments. Author (GRA)

N79-14196# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
STRUCTURE AND FLOW OF AMORPHOUS ALLOYS
Frans Spaepen Aug. 1978 40 p refs
(Contract N00014-77-C-0002)
(AD-A059701; TR-5) Avail: NTIS HC A03/MF A01 CSCL 20/12

This paper, if it is to stay within reasonable limits, cannot possibly be as general as the title indicates. Therefore, rather than trying to cover all the recent developments in the study of structure and flow, an attempt will be made to provide a link between the two subjects: the emphasis will be on those structural aspects that are important for flow and on a description of the flow process that is as consistent as possible with the structural findings. In a first section, recent developments in the study of the structure of amorphous alloys are reviewed. The discussion is limited to the transition metal-metalloid glasses, mainly because they are the oldest and best studied group. In amorphous systems as well as in crystals, atomic transport is governed by structural imperfections. As discussed in the second section, defects in amorphous metals are probably more diffuse than in crystals and can therefore best be described as individual sites with small perturbations of the local short range order. In the third section this is applied to problems of steady state plastic flow. First, the experiments are reviewed by means of an empirical deformation mechanism map. Then, an attempt is made to describe the basic processes, homogeneous and inhomogeneous flow. GRA

N79-14197# Battelle Columbus Labs., Ohio.
METAL PHYSICS AND TITANIUM-ALUMINUM ALLOYS Final Report, 1 Jan. 1975 - 31 Dec. 1977
E. W. Collings 24 Feb. 1978 115 p refs
(Grant AF-AFOSR-75-2786)
(AD-A059720; AFOSR-78-1240TR) Avail: NTIS HC A06/MF A01 CSCL 11/6

Room temperature magnetic susceptibility studies have been made on a series of Ti-Al alloys in the composition range 30-57 at-%Al, quenched from anneals at 900, 1065, 1165, 1265, 1315, and 1365C. As a result of this work, an equilibrium partial phase diagram has been constructed, compared with literature data, and discussed with reference to the results of a comprehensive metallographic and microhardness study. GRA

N79-14198# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.

THE EFFECTS OF CORROSION AND CATHODIC CHARGING ON FATIGUE CRACK PROPAGATION IN 7075-T651 ALUMINUM

Stephen E. Lebeau and David J. Duquette Aug. 1978 111 p refs

(Contract N00014-75-C-0466)

(AD-A059315) Avail: NTIS HC A06/MF A01 CSCL 11/6

Corrosion fatigue crack propagation tests were performed on 7075 aluminum in dry argon, and solutions of NaCl and Na_2SO_4 under free corrosion conditions and under applied polarization. Bulk solution pH and oxygen level were also varied. Tests were also conducted in air after pre-exposure to an aggressive environment. Results indicate that both aqueous solutions appreciably increase fatigue crack growth rates. The Cl-ion generally produces the greatest increase in fatigue crack growth rate. Results indicate that adjusting bulk solution pH and decreasing the oxygen level can accelerate fatigue cracking. The magnitude of these effects is a function of the electrochemical conditions and the integrity of the oxide film at the crack tip. GRA

N79-14199# Battelle Columbus Labs., Ohio.

AMORPHOUS GLASSY METAL AND MICROCRYSTALLINE ALLOYS FOR AEROSPACE APPLICATIONS Final Report, Jan. 1975 - Aug. 1977

E. W. Collings, R. E. Maringer, and C. E. Mobley Jun. 1978 257 p refs

(Contract F33615-74-C-5179; AF Proj. 7351)

(AD-A060353; AFML-TR-78-70) Avail: NTIS HC A12/MF A01 CSCL 11/6

This report discusses the results of a program, initiated in January, 1975, for the preparation and examination of the mechanical characteristics of amorphous and rapidly-quenched polycrystalline alloys with properties relevant to aerospace applications. In it are described (1) the preparation and properties of a rapidly quenched Ti-6Al-4V alloy powder substitute, and its successful consolidation by vacuum-hot-pressing and hot-isostatic-pressing into test shapes from which were machined tensile bars and compression-test specimens. Composition was found to be retained, and the properties of the wrought starting material were essentially recovered; (2) the preparation by sputtering, splat quenching, melt spinning and melt extraction of 30 metallic glass candidate alloys, and the measurement of several of their properties. The performance of 'solution strengthening' studies on a well-categorized metallic glass basic alloy, $FE_{80}P_{13}C_7$, and the preparation and examination of the properties of an advanced high-specific-strength Ti-base Be-free metallic-glass alloy; (3) the examination of melt-extracted rapidly-quenched-polycrystalline solution- and precipitate-strengthened Ti-base fibers, and the preparation and properties of a ductile polycrystalline Ti-base fiber with specific strength comparable to that of the best metallic glass ribbon fiber presently available.

Author (GRA)

N79-14200# United States Steel Corp., Monroeville, Pa. Research Lab.

EFFECT OF PURITY ON RELIABILITY CHARACTERISTICS OF HIGH STRENGTH STEEL Final Report, May 1975 - Dec. 1977

S. R. Novak, A. W. Loginow, H. M. Reichhold, J. G. Bassett, and G. C. McLelvey Jul. 1978 107 p refs

(Contract F33615-75-C-5137)

(AD-A060298; Rept-74-H-020(018/011-1); AFML-TR-78-89) Avail: NTIS HC A06/MF A01 CSCL 11/6

The effect of high purity on the mechanical properties and/or environmental-cracking properties of 4340, 18Ni (250 grade) maraging, and 10Ni-modified (AF1410) steels was investigated at a tensile-strength of about 250,000 psi. Normal- and high-purity laboratory-produced materials were tested for each steel. Only the tensile properties of the 4340 steel were determined, whereas for the 10Ni and 18Ni steels the fracture toughness and sensitivity to environmental cracking were also determined. High purity in the 10Ni and 18Ni steels resulted in significantly higher K(Ic) (Fracture toughness) values and increased resistance to stress-corrosion cracking (SCC) in 3.5 percent NaCl solution as established by longer t(inc) and slower da/dt values; high purity in the 10Ni steel increased K(Iscc) (SCC threshold) by a factor of 2.3, and no effect was found for the 18Ni steel. No significant effects of purity were found in smooth-specimen SCC tests in a marine atmosphere; however, the 10Ni steel was immune to SCC and the 18Ni steel was highly susceptible. In limited-duration (1000 hour) tests in hydrogen gas at 40 psig, the high-purity 10Ni steel exhibited no crack extension at high K(I) levels, whereas the other three steels cracked extensively at low K(I) levels. The results show that high purity can improve resistance to fracture and environmental-cracking susceptibility, but the extent of improvement is dependent on the steel-alloy system. GRA

N79-14201# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.

THE BEHAVIOR AND PROPERTIES OF SPLAT COOLED AMORPHOUS AND CRYSTALLINE ALLOYS, WITH EMPHASIS ON Cu-Zr ALLOYS Final Report, 1 Jun. 1975 - 31 May 1978

J. B. VanderSande and N. J. Grant 22 Sep. 1978 7 p refs

(Contracts DAHC04-75-C-0012; DAAG29-75-C-0012)

(AD-A060041; ARO-12689.5-MS; FR-3) Avail: NTIS HC A02/MF A01 CSCL 11/6

This is a final report describing research on the devitrification of initially amorphous metallic alloys and the effect of such divitrification on mechanical properties for the Cu-Zr, Ni-Nb, and Pd-Si systems. Author (GRA)

N79-14202# United States Steel Corp., Monroeville, Pa. Research Lab.

EFFECT OF CRYSTALLOGRAPHIC TEXTURE ON THE MECHANICAL AND BALLISTIC PROPERTIES OF STEEL ARMOR Final Report, 18 Jul. 1977 - 18 Jul. 1978

Hsun Hu Jul. 1978 71 p refs

(Contract DAAG46-77-C-0037; DA Proj. 1L1-62105-AH-84)

(AD-A060074; AMMRC-TR-78-39; Rept-76-H-040) Avail: NTIS HC A04/MF A01 CSCL 19/4

Continuing the study of the effect of crystallographic texture on the mechanical and ballistic properties of steel armor, 1/2-inch-thick plates of a medium-carbon 5Ni-Si-Cu-Mo-V steel were produced with a (110) or an approximate (111) texture of various intensities. Although the intensities of these textures in the present plates (2.80 or 2.45 times random) were as strong as those in the small-size specimens previously processed under strictly controlled conditions, their effects on the ballistic performance were not sufficiently great to be of practical significance. For both these textures and at the relatively low intensity levels, the V50 ballistic limits appeared to increase with increasing texture intensity. Consistent with the relatively low texture intensities and ballistic limits, the spalling tendencies of the plates were mostly weak to moderate. GRA

N79-14203# Washington State Univ., Pullman. Dept. of Physics.

CHARACTERISTIC EXOEMISSION FROM OXIDE COVERED ALUMINUM ALLOYS Final Report

P. Braunlich and J. T. Dickinson Jul. 1978 133 p refs

(Contract F49620-77-C-0042; AF Proj. 2306)

(AD-A059562; AFOSR-78-1354TR) Avail: NTIS HC A07/MF A01 CSCL 11/6

Electrons, positive and negative ions as well as photons are known to be emitted from oxides of a number of metals during tensile deformation. It has been shown that the propagation of cracks in the oxide is uniquely associated with this so-called tribo-stimulated exoemission phenomenon. In this report experiments concerning the tribo-stimulated emission of negatively charged particles from oxidized bare and aluminum clad Al 2024 and Al 7075 are described. The investigated samples were anodically oxidized under various conditions to produce oxide layers of different thickness, as well as chemical and mechanical properties. The working hypothesis is that exoemission during tensile elongation is determined by the physical and chemical properties of the oxide layer. Evidence in support of this hypothesis is presented for the bare and clad alloys studied to date. The features of the exoemission curves (emission rate vs. strain of the substrate) that appear to be most sensitive to changes in the oxide layer are presented and discussed. Author (GRA)

N79-14204# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF FLOW STRUCTURE ON CORROSION: CIRCLING-FOIL STUDIES ON 90/10 COPPER-NICKEL, AND HYDRODYNAMIC MODELING OF THE EROSION-CORROSION PROCESS
G. Leumer, R. P. Schack, K. J. Graham, and J. Perkins May 1978 93 p refs
(AD-A059646; NPS-69PS-78-004; NPS-TR-8) Avail: NTIS HC A05/MF A01 CSCL 11/6

The effects of turbulent flow on the corrosion behavior of 90/10 Cu-Ni were studied experimentally in synthetic seawater electrolyte, using a circling foil apparatus at relative velocities up to about 6 m/sec. The flow field at the specimen surface was characterized by anemometric methods. Corrosion rates were determined by direct weight loss and by several electrochemical methods, including the linear polarization method and from Tafel plots; also zero resistance ammeter measurements were made on galvanic couples. Consideration was given to the question of the appropriate analytical approach to velocity (fluid flow) effects on corrosion processes. The contribution of convective diffusion is considered dominant over the velocity range studied, and the rate of eddy diffusivity (fine flow structure effects on mass transport) is described. The separate electrochemical and mechanical influences of high-intensity turbulent flows are considered. Author (GRA)

N79-14205# Rutgers - The State Univ., Piscataway, N. J. Coll. of Engineering.
DIFFUSION AND TRANSFORMATION MICROMECHANISMS FOR SUPPRESSION OF DAMAGE AND FAILURE IN HIGH-STRAIN RATE DEFORMATION Final Technical Report, 21 Jun. 1976 - 31 Aug. 1977
V. A. Greenhut Jul. 1978 46 p refs
(Grants DAAG29-76-G-0050; DAAG29-76-G-0281)
(AD-A059659; ARO-13624.1-MSX) Avail: NTIS HC A03/MF A01 CSCL 13/10

This report presents the results of a study of the decomposition of Al-10% Zn, Al-1.1% Si, and Al-10% Zn-1.1% Si alloys, studied using a 200-kV electron microscope in order to characterize microstructures after different aging treatments and to relate the structures to mechanical properties. This determination of quasi-static properties was undertaken as part of a study of the response of the microstructure of these alloys to shock loading. Author (GRA)

N79-14206# Texas Univ. at Austin. Dept. of Physics.
A STUDY OF ADSORBED MOLECULES ON METAL SURFACES Final Report
P. R. Antoniewicz and W. D. McCormick Aug. 1978 48 p refs
(Contract N00014-75-C-0538)
(AD-A059495) Avail: NTIS HC A03/MF A01 CSCL 07/4

The adsorption of nitrogen on gold using a new capacitance technique was measured. At both high and low coverages interesting results have been obtained concerning the interaction of N2 molecules and the gold substrate. Some effects of the interaction of adsorbates with metal substrates were examined. The effect of adsorbates at a hydrocarbon-water interface were also looked at. GRA

N79-14207# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics.
ROOM TEMPERATURE RATE SENSITIVITY, CREEP, AND RELAXATION OF TYPE 304 STAINLESS STEEL
Erhard Krempl Jul. 1978 30 p refs
(Contract N00014-76-C-0231)
(AD-A060150; RPI-CS-78-5) Avail: NTIS HC A03/MF A01 CSCL 11/6

The results show significant rate sensitivity, creep, and relaxation. Test histories involving loading and unloading with positive loads up to 15% strain show that the relaxation behavior in the plastic range depends only on the strain rate preceding the relaxation test and is independent of the strain magnitude. Also, the relaxation behavior is uniquely related to the stress changes corresponding to instantaneous large changes in the strain rate during tensile tests. Completely reversed strain controlled loading gradually changes the stress-change strain-rate-change behavior. Annealed specimens and specimens loaded to a cyclic steady state differ not only in their work hardening characteristic but also in their rate-dependent behavior. In the cyclic steady state, different hysteresis loops are traced for different strain rates with fully reversible transitions from one hysteresis loop to the other under strain-rate changes. These results support the notion that viscoplasticity can be represented by piecewise nonlinear viscoelasticity. GRA

N79-14208# Oak Ridge National Lab., Tenn.
THERMAL AGING EFFECTS ON THE MECHANICAL PROPERTIES OF ANNEALED 2 1/4 CR-1 MO STEEL
R. L. Klush Nov. 1977 37 p refs
(Contract W-7405-eng-26)
(ORNL-5324) Avail: NTIS HC A03/MF A01

Four commercially annealed tubing heats of 2 1/4 Cr-1 Mo steel were aged at 454, 510, and 566 C for various times up to 20,000 hr. Tensile tests were made at room temperature and at the aging temperature on specimens from each heat for each aging condition. Creep tests were made on specimens from two of the heats. Thermal aging significantly changed both the room temperature and the aging temperature tensile properties, the effect being greatest for tests at the aging temperature. The amount and magnitude of the strength changes varied from one heat to another. After aging for 20,000 hr at 454 and 510 C, the strength of one heat increased. However, the other three heats showed decreases in yield strength and ultimate tensile strength of up to 40%, the maximum effect occurring at 566 C. Similar large changes in creep-rupture properties were also observed. DOE

N79-14209# Battelle Pacific Northwest Labs., Richland, Wash.
ZIRCALOY CLADDING ID/OD OXIDATION STUDIES Final Report
R. E. Westerman and G. M. Heasson Nov. 1977 130 p refs
(EPRI-NP-525) Avail: NTIS HC A07/MF A01

The ID/OD oxide ratio that forms on Zircaloy tubing at temperatures relevant to postulated LOCA conditions was measured as a function of time, temperature, and distance from the rupture. The average ratio at the rupture position was less than unity, and decreased with decreasing test time and increasing distance from the point of rupture. The maximum observed ID/OD oxide ratio was 1.4. Ratios in excess of unity were typically found to be a consequence of the OD oxide being thinner than were anticipated from the nominal test conditions. Confirmatory data were also obtained on the isothermal oxidation kinetics of Zircaloy. These data are in good agreement with those obtained by other investigators and confirm the conservative nature of the Baker-Just equation that is required for use in licensing calculations. DOE

N79-14210# Ohio State Univ., Columbus. Dept. of Metallurgical Engineering.
CORROSION, STRESS CORROSION CRACKING, AND ELECTROCHEMISTRY OF THE IRON AND NICKEL BASE ALLOYS IN CAUSTIC ENVIRONMENTS Progress Report, 1 Mar. 1977 - 28 Feb. 1978
R. W. Staehle and A. K. Agrawal 1978 59 p refs
(Contract EY-76-S-02-2421)
(COO-2421-4) Avail: NTIS HC A04/MF A01

The straining electrode technique was used to evaluate the stress corrosion cracking (SCC) susceptibility of AISI 304 stainless steel in 20N NaOH solution, and of Inconel 600 alloy and incoloy 800 alloy in boiling 17.5N NaOH solution. The crack propagation rate estimated from the straining experiments correlated well with the previous constant load experiments. It was found that the straining electrode technique was a useful method for estimating, through short term experiments, parameters like crack propagation rate, crack morphology, and repassivation rate, as a function of the electrode potential. The role of alloying elements on the crack propagation rate in the above alloys are also discussed. DOE

N79-14211# Los Alamos Scientific Lab., N. Mex.
PHASE EQUILIBRIA THERMODYNAMICS, AND CRYSTAL STRUCTURES FOR THE Pu-Pt-Rh SYSTEM
D. E. Peterson, C. C. Land, and R. B. Roof Dec. 1977 31 p refs

(Contract W-7405-eng-36)
(LA-6968) Avail: NTIS HC A03/MF A01

Phase diagrams and thermodynamic properties for the Pu-Pt, Pu-Rh, and Pu-Pt-Rh systems were determined for the regions of high platinum and rhodium. A new phase, PuPt, was discovered; three polymorphic transitions were associated with the PuPt, phase; and crystal structures were determined for the PuPt, and PuPt, phases and the intermediate PuPt, polymorph. Sublimation behavior and thermodynamic properties of selected Pu-Pt and Pu-Rh phases were determined by target collection and mass spectrometry. Dissociation to the elements was the predominant sublimation reaction up to 1800 C. The high thermodynamic stability of these phases was analyzed in terms of the electronic configurations of the constituent elements. DOE

N79-14212# Oak Ridge National Lab., Tenn.
EFFECTS OF COMPOSITION VARIABLES ON THE TENSILE PROPERTIES ON TYPE 304 STAINLESS STEEL
M. K. Booker and V. K. Sikka 1977 59 p refs Presented at Symp. on Influence of Carbon, Nitrogen, and Residual Element Chem. on the Behavior of Austenitic Stainless Steels Used in Construction, Atlanta, Ga., 14 Nov. 1977
(CONF-771140-1) Avail: NTIS HC A04/MF A01

Type 304 stainless steel is known to exhibit significant heat-to-heat variations in mechanical behavior. Results of an analysis of the effects of grain size and chemical composition on the tensile properties of 20 heats of type 304 stainless steel are presented. Since the material involved came from commercial heats, the ranges in composition of some elements do not permit a clear delineation of the effects of those elements. Nevertheless, regression equations reflecting the effects of various variables were developed. These equations describe the data reasonably well, whereas comparison with similar equations obtained by previous investigators yielded generally unsatisfactory results. The effects of carbon, nitrogen, and grain size were addressed. DOE

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N79-14213* National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH TEMPERATURE RESISTANT CERMET AND CERAMIC COMPOSITIONS Patent
Wayne M. Phillips, inventor (to NASA) (JPL) Issued 26 Dec. 1978 8 p Filed 8 Dec. 1977 Supersedes N78-25218 (16 - 16, p 2094) Division of US Patent Appl. SN-633876, filed 20 Nov. 1975, US Patent-4,072,532 Sponsored by NASA
(NASA-Case-NPO-13690-2; US-Patent-4,131,459;
US-Patent-Appl-SN-858766; US-Patent-Class-75-203;
US-Patent-Class-75-205; US-Patent-Class-75-206;
US-Patent-Class-75-212; US-Patent-Class-75-226;
US-Patent-Class-264-60; US-Patent-Appl-SN-633876;
US-Patent-4,072,532) Avail: US Patent and Trademark Office CSCL 11C

Cermet compositions having high temperature oxidation resistance, high hardness and high abrasion and wear resistance, and particularly adapted for production of high temperature resistant cermet insulator bodies are presented. The compositions are comprised of a sintered body of particles of a high temperature resistant metal or metal alloy, preferably molybdenum or tungsten particles, dispersed in and bonded to a solid solution formed of aluminum oxide and silicon nitride, and particularly a ternary solid solution formed of a mixture of aluminum oxide, silicon nitride and aluminum nitride. Also disclosed are novel ceramic compositions comprising a sintered solid solution of aluminum oxide, silicon nitride and aluminum nitride.
Official Gazette of the U.S. Patent and Trademark Office

N79-14214* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PREPARATION OF DIELECTRIC COATING OF VARIABLE DIELECTRIC CONSTANT BY PLASMA POLYMERIZATION Patent
Martin Hudis (Allis-Chalmers, Milwaukee) and Theodore Wydeven, inventors (to NASA) Issued 2 Jan. 1979 8 p Filed 11 Feb. 1977 Supersedes N77-17245 (15 - 08, p 1010) Division of abandoned US Patent Appl. SN-589172, filed 23 Jun. 1975
(NASA-Case-ARC-10892-2; US-Patent-4,132,829;
US-Patent-Appl-SN-767912; US-Patent-Class-428-411;
US-Patent-Class-427-41; US-Patent-Class-427-294;
US-Patent-Appl-SN-589172) Avail: US Patent and Trademark Office CSCL 07C

A plasma polymerization process for the deposition of a dielectric polymer coating on a substrate comprising disposing of the substrate in a closed reactor between two temperature controlled electrodes connected to a power supply is presented. A vacuum is maintained within the closed reactor, causing a monomer gas or gas mixture of a monomer and diluent to flow into the reactor, generating a plasma between the electrodes. The vacuum varies and controls the dielectric constant of the polymer coating being deposited by regulating the gas total and partial pressure, the electric field strength and frequency, and the current density.
Official Gazette of the U.S. Patent and Trademark Office

N79-14215*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TESTING AND ENVIRONMENTAL EXPOSURE OF PARACHUTE MATERIALS FOR THE SOLID ROCKET BOOSTER DECELERATOR SUBSYSTEM
B. K. Tannehill Dec. 1978 73 p refs
(NASA-TM-78204; M-275) Avail: NTIS HC A04/MF A01 CSCL 11E

Static tests and evaluation of nonmetallic materials for use in parachutes for recovery of solid rocket boosters used in the space shuttle program are reported. Literature survey and manufacturer and vendor contacts led to the choice of nylon as the fabric most capable of withstanding the extreme loads and environmental conditions during repeated use. The material tests included rupture strength, elongation, abrasion resistance, shrinkage, environmental exposure, and degradation levels. Rinsing and drying procedures were also investigated and a salt-free level for nylon recommended in preparation for reuse. In all possible cases, worst-case conditions were used (e.g., inflation loads, seawater exposure for 3 days per drop-recovery, etc.).
G.G.

N79-14216# Brandeis Univ., Waltham, Mass. Dept. of Chemistry.
AN INTRODUCTION TO THE SOLID STATE POLYMERIZATION OF TRANSITION-METAL COMPLEXES: A COMPARATIVE STUDY
Kent Cheng, Bruce M. Foxman, and Susan W. Gerstein Jul. 1978 10 p refs Submitted for publication
(Contract N00014-76-C-0822; NR Proj. 053-619)
(AD-A059372; TR-3) Avail: NTIS HC A02/MF A01 CSCL 07/2

Preliminary studies in this laboratory of topochemical and topotactic polyreactions of NiBr2(P(CH2CH2CN)3)2 have shown that the reactions are in many cases characterized by (1) product specificity, (2) stereospecificity, (3) 'crystallographic specificity' and (4) highly anisotropic 'front motion' through individual single crystals. GRA

N79-14217# Dow Chemical Co., Walnut Creek, Calif.
FABRICATION OF FIBERGLASS REINFORCED PLASTIC SURFACING UNDER WET CONDITIONS Final Report
Theo J. West Sep. 1978 72 p refs
(Contract N68305-77-C-0005)
(AD-A059698; CEL-CR-78.018) Avail: NTIS HC A04/MF A01 CSCL 11/2

The purpose of this investigation was to develop a system to be used in the construction of fiberglass-reinforced plastic surfacings for soil under wet conditions. The effect of water in the substrate and in the fiberglass mat, on laminate properties, has been defined and solutions have been developed for some of the problems. A system of chemical components has been developed for the field placement of the reinforced plastic soil surfacings under wet conditions, that is superior to that presently used and is usable with the basic spray equipment now used by the Marine Corps. GRA

N79-14218# Naval Civil Engineering Lab., Port Hueneme, Calif.
IMPROVED CHEMICALS FOR FIBERGLASS-REINFORCED PLASTIC SOIL SURFACINGS: FIELD EVALUATION Progress Report, Jan. 1977 - Jan. 1978
M. C. Hironaka Sep. 1978 30 p refs
(YF53536091)
(AD-A060094; CEL-TN-1527) Avail: NTIS HC A03/MF A01 CSCL 11/2

A new chemical formulation was recently developed for constructing fiberglass-reinforced plastic surfacings for soils; it consists of a polyester resin, cumene hydroperoxide catalysts, and Vanadium Ten-Cem/N,N-dimethyl-p-toluidine solution promoter. This report documents the field testing of this new formulation with present Marine Corps spraying equipment. It was found that the new formulation is superior to the formulation used in the past because it: (1) provides surfacings with higher strength properties;(2) is easier to mix due to the constant ratio of 1.0 to 0.25 between catalyst and promoter for any temperature; (3) is more economical to use in temperatures below 110 F; and (4) increases pumping/spraying reliability by eliminating the catalyst material that precipitates out of the emulsion during storage and eventually causes fouling of check valves and other pumping mechanisms. Furthermore, it was found that the resin used in this new formulation has a shelf life of more than 5 years based on accelerated aging tests as compared to the previously used resin, which had a guaranteed shelf life of only 4 months at the same temperatures. Author (GRA)

N79-14219# Office of Naval Research, Arlington, Va.
WORKSHOP ON THERMAL SHOCK OF CERAMICS: SUMMARY OF PROCEEDINGS
P. F. Becher, S. W. Freiman, and A. M. Diness Dec. 1977 62 p refs Workshop held at White Oak, Md., 19-20 Dec. 1977
(RR0220201)
(AD-A060003) Avail: NTIS HC A04/MF A01 CSCL 11/2

A workshop on thermal shock behavior of ceramic materials was held on December 19 and 20, 1977. Experts in the area discussed several aspects of thermal shock of ceramics, including theory and analysis, applications limitations and thermal shock test methods. In addition to 18 abstracts, a summary of the main points presented or discussed during this meeting is included in this report. A number of gaps in understanding of thermal shock behavior of ceramics and specific recommendations on how to overcome them are identified. Author (GRA)

N79-14220# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
LOAD RELAXATION STUDIES OF A METALLIC GLASS
T. D. Hadney, D. J. Krenisky, D. G. Ast, and Che-Yu Li 1977 4 p refs Sponsored by DOE
(NR Proj. 039-151)
(COO-2172-20) Avail: NTIS HC A02/MF A01

Experimental results of load relaxation studies are reported for a commercial metallic glass as a function of temperature. The data suggested that metallic glasses exhibit deformation behavior with flow laws similar to those governing plastic deformation in crystalline solids. The lack of appreciable work hardening in annealed material and the identification of an anelastic component were also indicated by the experimental observations. DOE

N79-14221# California State Dept. of Transportation, Sacramento. Office of Transportation Lab.
IMPROVEMENT OF THE PERFORMANCE OF ZINC RICH PRIMER Final Report, 1977 - 1978
R. Warness Jun. 1978 17 p
(PB-285852/0; TL-657283; FHWA/CA/TL-78/21) Avail: NTIS HC A02/MF A01 CSCL 11C

The performance of an organic zinc-rich primer formulated with various zinc dusts, suspending agents and moisture control materials was evaluated. Some zinc dusts and additives adversely affected the performance when tested according to ASTM B117, Salt spray. GRA

N79-14222# National Technical Information Service, Springfield, Va.
ADHESIVES: PROPERTIES, PREPARATION AND APPLICATIONS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1976 - Nov. 1978
Mona F. Smith Nov. 1978 207 p Supersedes NTIS/PS-77/1060; NTIS/PS-76/0892; NTIS/PS-75/704; NTIS/PS-75/040
(NTIS/PS-78/1180/5; NTIS/PS-77/1060; NTIS/PS-76/0892; NTIS/PS-75/704; NTIS/PS-75/040) Avail: NTIS HC $28.00/MF $28.00 CSCL 11A

Studies on polymer chemistry, curing, crosslinking, and synthesis for use as adhesives are cited. The heat resistance, fracture, aging, shear strength, and other physical and mechanical properties of adhesives and sealants are covered, as is the use of adhesives in aircraft, laminates, wood bonding, electronics, and spacecraft. GRA

N79-14223# National Technical Information Service, Springfield, Va.
FIRE RESISTANCE OF FIBERS AND TEXTILES, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report 1976 - Oct. 1978
Diane M. Cavagnaro Nov. 1978 196 p Supersedes NTIS/PS-77/1044; NTIS/PS-76/0864; NTIS/PS-75/757; NTIS/PS-74/111
(NTIS/PS-78/1200/1; NTIS/PS-77/044; NTIS/PS-76/0864; NTIS/PS-75/757; NTIS/PS-74/111) Avail: NTIS HC $28.00/MF $28.00 CSCL 11E

A bibliography containing 189 abstracts concerning the preparation and flammability of flame resistant organic fibers and textiles are presented. The bibliography includes new cellulosic synthetic resins, flameproofing additives, and standards, as well as safety of the existing consumer products. GRA

N79-14224# National Technical Information Service, Springfield, Va.
FIRE RESISTANCE OF FIBERS AND TEXTILES VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1975 - 1976
Diane M. Cavagnaro Nov. 1978 209 p
(NTIS/PS-78/1201/9) Avail: NTIS HC $28.00/MF $28.00 CSCL 11E

A bibliography containing 200 abstracts concerning preparation and flammability of organic fibers and textiles is presented. The synthesis, flammability standards, testing, flameproofing additives, safety factor of existing consumer products and the durability of the product tested were also included. GRA

N79-14225# National Technical Information Service, Springfield, Va.
FIRE RESISTANCE OF FIBERS AND TEXTILES, VOLUME 4. CITATIONS FROM THE ENGINEERING INDEX Progress Report, 1977 - Oct. 1978
Diane M. Cavagnaro Nov. 1978 140 p Supersedes NTIS/PS-77/1045; NTIS/PS-76/0867
(NTIS/PS-78/1202/7; NTIS/PS-77/1045; NTIS/PS-76/0867) Avail: NTIS HC $28.00/MF $28.00 CSCL 11E

Worldwide research citations that pertain to the preparation and flammability of flame resistant fibers and textiles are given. They include flammability standards, testing, synthesis, safety factors of existing consumer products, flameproofing additives, and the durability of the product tested. GRA

N79-14226# National Technical Information Service, Springfield, Va.
FOAMED PLASTICS. PART 1: POLYURETHANE FOAMS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Nov. 1978
Mona F. Smith Nov. 1978 272 p Supersedes NTIS/PS-77/1061; NTIS/PS-76/-0839; NTIS/PS-75/634
(NTIS/PS-78/1188/8; NTIS/PS-77/1061) Avail: NTIS HC $28.00/MF $28.00 CSCL 11I

Research concerning the fabrication, mechanical, and physical properties, chemical characteristics, and applications of polyurethane foams are cited. Some of the applications include structural panels, floats, buoyant materials, thermal insulation, and packaging materials. This updated bibliography contains 265 abstracts, 24 of which are new entries to the previous edition. GRA

N79-14227# National Technical Information Service, Springfield, Va.

FOAMED PLASTICS. PART 2: STYRENE, SILICONE, EPOXY, AND OTHER POLYMERIC FOAMS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Nov. 1978

Mona F. Smith Nov. 1978 256 p Supersedes NTIS/PS-77/1062; NTIS/PS-76/0840; NTIS/PS-75/635 (NTIS/PS-78/1189/6; NTIS/PS-77/1062; NTIS/PS-76/0840; NTIS/PS-75/635) Avail: NTIS HC $28.00/MF $28.00 CSCL 11I

The fabrication, mechanical and chemical properties, and applications of foamed plastics (except polyurethane) are covered in this bibliography. The major polymers studied are styrene, silicone, epoxy, cellulosic, ethylene, and imide resins. Applications include structural panels, electric and thermal insulation, and floats. This updated bibliography contains 249 abstracts, 24 of which are new entries to the previous edition. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N79-14228* National Aeronautics and Space Administration. Pasadena Office, Calif.

INHIBITED SOLID PROPELLANT COMPOSITION CONTAINING BERYLLIUM HYDRIDE Patent

Wallace W. Thompson, inventor (to NASA) (JPL) Issued 5 Sep. 1978 3 p Filed 5 Aug. 1969 Sponsored by NASA (NASA-Case-NPO-10866-1; US-Patent-4,111,729; US-Patent-Appl-SN-849274; US-Patent-Class-149-19.9; US-Patent-Class-149-19.92; US-Patent-Class-149-20) Avail: US Patent and Trademark Office CSCL 21I

An object of this invention is to provide a composition of beryllium hydride and carboxy-terminated polybutadiene which is stable. Another object of this invention is to provide a method for inhibiting the reactivity of beryllium hydride toward carboxy-terminated polybutadiene. It was found that a small amount of lecithin inhibits the reaction of beryllium hydride with the acid groups in carboxy terminated polybutadiene.

Official Gazette of the U.S. Patent and Trademark Office

N79-14229# Ballistic Research Labs., Aberdeen Proving Ground, Md.

SIMULATION OF LOW LEVEL EXPLOSIVES BLAST LOADINGS AT FULL SCALE BY MODIFICATIONS TO BRL DUAL SHOCK TUBE FACILITY Final Report

Edmund J. Gion Jul. 1978 40 p refs (AD-A059854; AD-E430104; ABBRL-MR-02853) Avail: NTIS HC A03/MF A01 CSCL 19/1

A concept is described permitting full scale testing of walls, of 3.7m (12 ft) height under simulated explosive blast loadings with pressures about 70 kPa (10 psi), 50ms positive duration. The existing BRL 2.4m (8 ft) diameter shock tube with modification was the hardware motivating the inquiry; and this hardware is used by way of example in the calculation of numbers and graphs. An enlarged 3.7m test or driven section is added to the 2.4m driver section to accommodate full scale test dimensions. The normal straight shock tube operating cycle is then extended by testing at a location where the reflected expansion waves from the breech overtake and weaken the shock. The resulting pressure loading is a decaying pulse (i.e., blast-wave type) with determinable duration. A requirement on the loading duration may conversely be used to specify the appropriate tube lengths involved. The methods are described which account for the differences in operation between a straight and an area-changed shock tube, which apparently have not been done before for the subsonic conditions encountered here.

Author (GRA)

N79-14230# Naval Postgraduate School, Monterey, Calif.

APPLICATION OF LIGHT EXTINCTION MEASUREMENTS TO THE STUDY OF COMBUSTION IN SOLID FUEL RAMJETS M.S. Thesis

Michael Hewett Jun. 1978 47 p refs (AD-A059879) Avail: NTIS HC A03/MF A01 CSCL 21/2

An experimental investigation of the combustion behavior in solid fuel ramjets was conducted. Optical light extinction measurements were employed to determine the effects of fuel composition and bypass ratio on the combustion efficiency, percent and size of unburned carbon, and fuel regression rate. Utility and limitations of the optical method are presented.

Author (GRA)

N79-14231# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.

EVALUATION OF FUTURE JET FUEL COMBUSTION CHARACTERISTICS Final Report, 1 Jul. 1975 - 30 Nov. 1976

W. S. Blazowski and T. A. Jackson Jul. 1978 74 p refs (AF Proj. 3048) (AD-A060218; AFAPL-TR-77-93) Avail: NTIS HC A04/MF A01 CSCL 21/4

Future anticipated changes in jet fuel character can be expected to have substantial combustion system effects. This report contributes technical information to assist in future definition of new jet fuel specifications formulated with the intent of minimizing total cost of system operation while maintaining performance and flight safety. The impact of lower fuel hydrogen content on combustor liner temperatures, smoke, and gaseous emissions has been evaluated and improved correlations with hydrogen content have been developed. Results obtained with the various fuel blends tested have confirmed the dominant influence of hydrogen content on combustion characteristics when compared to volatility and hydrocarbon type effects. Use of the new non-dimensional liner temperature parameter has also resulted in a good correlation of a wide variety of previous combustor data involving rich combustion systems. GRA

N79-14232# Southwest Research Inst., San Antonio, Tex. Fuels and Lubricants Research Lab.

HIGH SULFUR FUEL EFFECTS IN A TWO-CYCLE HIGH SPEED ARMY DIESEL ENGINE Interim Report

Edwin A. Frame May 1978 151 p refs (Contracts DAAK70-78-C-0001; DAAG56-76-C-0003) (AD-A059534; AFLRL-105) Avail: NTIS HC A08/MF A01 CSCL 21/4

The effects of increasing the fuel sulfur content while using a constant lubricant (MIL-L-2104C) were determined. Key areas of engine distress were identified and baselines were established using high (1.0%w) and low (0.4%w) sulfur fuels. Effects of more frequent oil drain intervals were determined. Author (GRA)

N79-14233# Hazards Research Corp., Denville, N. J.

FLOW CHARACTERISTICS OF EXPLOSIVE SLURRY INJECTION SYSTEM

George Petino, Jr., Darl Westover, and Robert Scola Apr. 1977 80 p refs (Contract DAAA21-75-C-0104) (AD-A059985; ARLCD-CR-77004) Avail: NTIS HC A05/MF A01 CSCL 19/1

An experimental program has been performed to investigate the fluid flow characteristics of aqueous, explosive slurries in a flow system which simulated the conditions present in the Picatinny Arsenal fluidized bed incinerator. Aqueous slurries containing 15, 20, and 25% weight by TNT, Composition B, HMX, and M-1 propellant were flowed above, at and below the 3.64 fps (1.109 m/sec) injection gun design flow velocity. The tests proved that all the materials can be safely flowed in this particular system, with the exception of 12 mesh or larger M1 propellant particle sizes. The venturi flowmeter proved to be an effective means of monitoring slurry flow rate. Finally, it was found that water injected into a simulated combustion chamber, containing 0 to 6 psig (0-41.36 x 1000 pascals) air pressure, flows at a mass flow rate which is independent of chamber pressure.

Author (GRA)

N79-14234# Princeton Univ., N. J. Dept. of Aerospace and Mechanical Sciences.

HIGH PRESSURE BURNING RATES OF MULTI-BASE PROPELLANTS Final Report, 2 Jun. 1976 - 1 Sep. 1977

L. H. Caveny, L. M. Pokrocos, and C. R. Felsheim Dec. 1977

75 p refs
(Contract DAAA21-76-C-0230)
(AD-A060027; AMS-1377) Avail: NTIS HC A04/MF A01 CSCL 19/1

Burning rates of multi-base, nitrocellulose propellants at high pressure were measured using recently developed techniques. Since the intended application is in-process control, as-manufactured multi-perforated grains (finished as well as interrupted-process propellants) are used. Chamber pressurization to 345 MPa (50,000 psi) is achieved using a hydraulic pump, rather than by nitrogen intensifier systems; the burning interval is determined by timing either the period of acoustic emission or pressure rise. Burning rate data for several lots of M1, M26, M30, and HMX polyurethane propellants are presented. Burning rate consistency of M26 double-base propellant is good, i.e., coefficient of variation approx 1%. However, the burning rate variability of single base propellants is dependent on the dispersion of fibrous nitrocellulose. Burning rate exponents obtained under steady state burning conditions are about 20% higher than recent closed chamber results. The results from a large number of specimens tested during the study demonstrate that the apparatus and data analysis techniques can be efficiently used under production situations. Author (GRA)

N79-14235# Naval Air Systems Command, Washington, D. C.
NAVAL AIR SYSTEMS COMMAND-NAVAL RESEARCH LABORATORY WORKSHOP ON BASIC RESEARCH NEEDS FOR SYNTHETIC HYDROCARBON JET AIRCRAFT FUELS
1978 303 p refs Workshop held at Washington, D. C., 15-16 Jun. 1978
(AD-A060081) Avail: NTIS HC A14/MF A01 CSCL 21/4

The Workshop emphasized the technical aspects of synthetic jet fuels. The purpose was to examine what is known about synfuels, highlight current research programs, and suggest areas of basic research which are important to the future use of synthetic hydrocarbon fuels in jet aircraft. GRA

N79-14236# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab Section.
QUALIFICATIONS OF A NEW MAPO SOURCE AND ERL-510 CURING AGENT FOR MINUTEMAN STAGE 1 UF-2121 LINER
John A. Thompson Aug. 1978 29 p
(AD-A059917; MANCP-401(78)) Avail: NTIS HC A03/MF A01 CSCL 21/8

Thiokol Chemical Corporation/Wasatch Division used MAPO in the production of UF-2121 liner. Thiokol changed MAPO vendors and, therefore, qualification of the new source MAPO was required. Thiokol prepared specimens from the new source and also specimens from the original source which were used as the control material in the qualification testing. The specimens were transferred to Ogden ALC for testing and reporting of the data obtained. This report includes the test results for the first, second, third and fourth time testing of the control and special specimens at Ogden ALC. In all instances, the mean data for the control and special specimens are well above the minimum requirements found in TWR-7857 Rev A, Thiokol specimen data. Therefore, the capability of the liner from the new source material is expected to perform satisfactorily.
Author (GRA)

N79-14237# SRI International Corp., Menlo Park, Calif.
DEFLAGRATION-TO-DETONATION TRANSITION IN HMX-BASED PROPELLANTS Interim Report, 1 Jan. 1977 - 30 Apr. 1978
M. Cowperthwaite and J. T. Rosenberg Jun. 1978 12 p
(Contract F49620-77-C-0039)
(AD-A059660; AFOSR-78-1364TR) Avail: NTIS HC A02/MF A01 CSCL 19/1

Research on the deflagration-to-detonation transition (DDT) is important to the Air Force because many of the energetic propellants required for present and future long-range delivery systems are explosively filled compositions that are capable of undergoing DDT. HMX-based propellant, for example, usually burns reliably in rocket motors but has detonated and destroyed the motor on several occasions. Possible steps leading to detonation in the rocket motor are fracture of propellant ahead of the flame and the subsequent formation of shock waves produced by the increased burning rate of fractured propellant. But even in this case, the mechanism of DDT and the conditions for its initiation are not adequately understood. The long-range objective of the present research program is to develop a computational capability for assessing the DDT hazard in explosively filled propellants. The program is based on the concept that a basic understanding of the physical and chemical processes involved in DDT is necessary to achieve this objective. Combined theoretical and experimental studies to determine the pressure fields behind and ahead of the flame and to establish mechanisms of DDT are required to develop such understanding.
Author (GRA)

N79-14238# Norwegian Defence Research Establishment, Kjeller.
CALCULATION OF PRESSURE AND TEMPERATURE FROM EXPLOSIONS IN CONFINED SPACES
E. Stroemsoee 2 May 1978 17 p refs
(AD-A059840; NDRE-VM-318) Avail: NTIS HC A02/MF A01 CSCL 19/1

In a previous report estimates were made of the post-detonation pressure and temperature when TNT charges detonate in a closed chamber at loading densities varying from 0.2 to 270 kg/cu m. An important simplifying assumption was that reaction products other than C, CO, CO2, H2O and N2 could be neglected. For TNT this introduces no serious error as long as the post-detonation temperature remains below about 2900 K, i.e. for all loading densities except the range 0.3 to 1.2 kg/cu m, where oxygen balance is nearly obtained. For explosives with a higher detonation energy (eg RDX and PETN) this simplification is advisable only for loading densities well below those corresponding to oxygen balance. The objective of the present report is to present a refined and more general approach to this problem, particularly in the sense that many more explosion products are considered. GRA

N79-14239# Systems Research Labs., Inc., Dayton, Ohio. Aerosystems Research Div.
HIGH ENERGY MHD FUELS DEVELOPMENT PROGRAM Final Report, Mar. 1975 - Dec. 1977
Richard E. Eckels Apr. 1978 374 p refs
(Contract F33615-75-C-2043; AF Proj. 3145)
(AD-A060156; AFAPL-TR-78-10) Avail: NTIS HC A16/MF A01 CSCL 21/4

An analytical study compared the electrical conductivity and velocity squared product for several MHD liquid or liquified fuels. Aluminum additive to liquid hydrocarbon was found to be attractive for high power density MHD. A number of MHD power tests showed that developed emulsified slurry fuels were engineeringly feasible. Various emulsification processes are described.
Author (GRA)

N79-14240# Battelle Pacific Northwest Labs., Richland, Wash.
CATALYST DEVELOPMENT PROGRAM FOR HYDRODESULFURIZATION AND LIQUEFACTION OF COAL TO PRODUCE CLEAN BOILER FUELS Quarterly Report, Dec. 1976 - Feb. 1977
L. J. Hillenbrand, H. M. Grotta, G. W. Felton, and W. R. Alcorn Mar. 1977 16 p
(Contract E(49-18)-2321)
(FE-2321-12) Avail: NTIS HC A02/MF A01

The first series of candidate catalysts was identified for trial in a rapid screening reactor. The list is intended primarily as a survey of types with the intention to demonstrate that the screening tests show differences among these catalysts and to provide clues for development. A modified work plan was adopted for the rapid screening reactor, calling for use of a one liter autoclave with continuous gas purge. A catalyst holder basket was designed for trial, which suspends the catalyst in the gas phase of the autoclave during the preliminary liquefaction stage and then causes it to drop into the liquid phase for the subsequent catalytic transformation. A special heavy aromatic distillate from coal tar was identified for trial as the vehicle to be used in the rapid screening reactor. G.Y.

N79-14241# Energy Research and Development Administration, Grand Forks, N. Dak.
TECHNOLOGY AND USE OF LIGNITE

Gordon H. Gronhovd, comp. and Wayne R. Kube, Comp. 1977 96 p refs Symp. Held at Grand Forks, N. Dak., 18-19 May 1977
(GFERC/IC-77/1) Avail: NTIS HC A05/MF A01

Developments in the technology and utilization of low rank coals, are presented with emphasis on Western United States lignite and subbituminous coal. The potential of the low rank coals from the Northern Great Plains Coal Province as a source of energy for power generation and for conversion processes is covered. Other topics discussed include: combustion; liquefaction; gasification; emission control and regulation; and mined-land reclamation. DOE

N79-14242# Argonne National Lab., Ill. Chemical Engineering Div.

COAL LIQUEFACTION SUPPORT STUDIES. TASK 1: HEAT OF REACTION OF HYDROGEN WITH COAL SLURRIES. TASK 2: HEAT TRANSFER COEFFICIENT Quarterly Report, Apr. - Jun. 1977

J. Fischer, J. Young, R. Lo, T. Mulcahey, D. Fredrickson, R. Bane, T. Cannon, R. Brock, W. Wilson, and A. Jonke 1977 21 p refs
(Contract W-31-109-eng-38)
(ANL/CEN/FE-77-5) Avail: NTIS HC A02/MF A01

A development program is being carried out to obtain information applicable to the Synthoil process for converting coal to liquid fuel of low sulfur content. This report presents information on: (1) a calorimeter to measure heat of reaction of hydrogen with coal slurries; and (2) the contruction status and a test program for the apparatus for measuring heat transfer coefficients of Synthoil feed and effluents. DOE

N79-14243# General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.

COAL DESULFURIZATION USING MICROWAVE ENERGY Final Report, Aug. 1976 - Oct. 1977

P. D. Zavitsanos, K. W. Bleiler, J. A. Golden, and W. K. Kinkead Jun. 1978 79 p refs
(Contract EPA-68-02-2172)
(PB-285880/1; EPA-600/7-78-089) Avail: NTIS HC A05/MF A01 CSCL 08I

The use of microwave energy and NaOH to remove pyritic and organic sulfur from several U.S. coals is described. Exposure times on the order of 1 minute at 1 atmosphere of inert gas can remove up to 85% of the sulfur with little or no loss in heating value of the coal. Data analysis suggests that sulfur is converted to water soluble sulfides (Na2S, Na2Sx) in the process and that sulfur conversion follows first order reaction kinetics. The mechanism by which fast rates of desulfurization are accomplished is most probably related to the fast (and to some degree selective) in-depth heating of the bed. The activation of water, FeS2, and NaOH creates local volatization, high temperature and pressure conditions which accelerate sulfur reactions before the coal has a chance to decompose. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N79-14244# National Aviation Facilities Experimental Center, Atlantic City, N. J.

FIRE DETECTION, EXTINGUISHMENT, AND MATERIAL TESTS FOR AN AUTOMATED GUIDEWAY TRANSIT VEHICLE Final Report, May - Aug. 1976

Richard G. Hill and George R. Johnson May 1978 29 p refs Revised
(FAA Proj. 052-241-000)
(AD-A056229; FAA-NA-76-52-Rev) Avail: NTIS HC A03/MF A01 CSCL 13/12

Tests were conducted in a simulated automated guideway transit vehicle to determine the effectivity of a Halon 1301 fire-extinguishing system during various types of fires, evaluate a photoelectric and an ionization fire detection system, and compare various materials under full-scale fire conditions. A portion of a school bus supplied with an airflow system was used as the test article. Smoke density, temperature, carbon monoxide, and Halon 1301 concentrations were monitored throughout the tests. Hydrogen fluoride (HF) samples were taken during the fire extinguishing tests. Test results showed that the photoelectric detector was faster responding than the ionization detector. Material tests indicated that underseat fires were more severe than fires on or in the seat for both neoprene and urethane cushions. Author

N79-14245*# National Aeronautics and Space Administration, Washington, D. C.

IMPROVEMENTS TO THE SINGLE SCREW EXTRUDER

C. Hiemenz, G. Ziegmann, B. Franzkoch, W. Hoffmanns, and W. Michaeli Aug. 1977 66 p refs Transl. into English of German conf. paper Presented at the 8th Symp. on Plastics Process., Aachen, 24-26 Mar. 1976 Sec. 4, p 81-109 Transl. by Sci. Transl. Serv., Santa Barbara, Calif.
(Contract NAS7-100)
(NASA-TM-75159; Paper-17) Avail: NTIS HC A04/MF A01 CSCL 13H

The extrusion on a single screw extruder is examined. The process is divided into several steps: the dosage of the materials to be conveyed; the modification of the shape of the feeding opening which influences the feeding process and consequently the throughput of the extruder; optimizing the shape of the feeding zone to meet the specific material requirements; and plasticizing and homogenizing. J.M.S.

N79-14246# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.

CAUSES OF EXPLOSION IN A CLEANING PROCESS WITH LIQUEFIED NITROGEN

B. D. Melnik 1978 17 p refs Transl. into ENGLISH from Khim. Prom. (USSR), no. 9, Sep. 1962 p 625-630
(CSIR-Trans-1407) Avail: NTIS HC A02/MF A01

It was concluded by this research that olefins are formed during the process of conversion of natural and backwash gas into synthetic gas. The presence of nitrogen oxides in the gas is due to nitrates and nitrites of ammonium contained in the sprinkling water that interact with hydrogen sulfide dissolved in it; the presence of the oxides is also a result of thermal decomposition of nitrous acid. Olefins join higher nitrogen oxides, thus forming compounds with explosive potential. It is necessary to point out that olefins, in the presence of a great surplus of oxygen, may form peroxide or ozonide compounds with explosive potential even when nitrogen oxides are not present. It follows that the same attention should be given to the removal of olefins from hydrogen as to the removal of nitrogen oxides. G.Y.

N79-14247# New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.

CHARACTERIZING EXPANSIVE SOILS FOR AIRPORT PAVEMENT DESIGN Interim Report, Feb. 1977 - Apr. 1978

Eric H. McKeen and John P. Nielson Aug. 1978 125 p refs
(Contract DOT-FA75WAI-531)
(AD-A059785; CERF-AP-28; FAA-RD-78-89) Avail: NTIS HC A06/MF A01 CSCL 13/2

A reliable rapid method of categorizing expansive soils was developed. Three procedures are recommended: (1) measurement of bulk density change in natural soil clods, (2) determination of clay content; or (3) determination of the moisture-suction relationship with particular attention to aggregation. Each of these procedures considered correlations with soil compressibility with respect to suction changes. Actual activity depends on imposed loads, initial suction, and final suction. The major obstacle to satisfactory development of this system remains the relation between differential heave and airport pavement roughness. The most acceptable criteria found were categories developed for application to residential concrete slabs on expansive soils. The limitations of this system are recognized but accepted as the best presently available. G.G.

N79-14248# Army Construction Engineering Research Lab., Champaign, Ill.

METHODS FOR SEISMIC STRENGTHENING OF BUILDINGS Interim Report

J. M. Lybas Jul. 1978 33 p refs
(Da Proj. 4A7-62731-AT-41)
(AD-A058344; CERL-IR-M-249) Avail: NTIS HC A03/MF A01 CSCL 08/11

The purpose of this study is to develop guidance for engineers to use in strengthening buildings found to be deficient in seismic resistance. The guidance is intended to serve as the basis for criteria for determining the suitability of specific strengthening schemes for a building and for the application of specific strengthening methods. GRA

N79-14248# Lehigh Univ., Bethlehem, Pa.
USE OF POLYMERS IN HIGHWAY CONCRETE Final Report
J. A. Manson, W. F. Chen, J. W. Vanderhoff, H. C. Mehta, and P. D. Cady Jul. 1978 87 p refs Sponsored in part by Amer. Assoc. of State Highway and Transportation Officials, Wash., D. C.
(PB-286027/8; TRB/NCHRP/REP-190; ISBN-0-309-027-78-0; LCCN-78-66463) Avail: NTIS HC A05/MF A01 CSCL 13C

A series of laboratory and field studies are described which were undertaken to demonstrate the feasibility of polymer impregnation of concrete bridge decks from the upper surface to depths that will encase the top layer of reinforcement to arrest or prevent spall- and pothole-causing corrosive action. Deep impregnation of typical salt-contaminated concrete was achieved in the laboratory when the concrete was brought to a bone-dry condition. Impregnation was found to arrest the corrosion of reinforcing steel, virtually eliminate freeze-thaw damage, and substantially increase the resistance of the concrete to chemical attack. GRA

N79-14250# Houston Univ., Tex. Cullen Coll. of Engineering.
FEASIBILITY OF ZERO AQUEOUS BLOWDOWN FROM COOLING TOWERS BY SIDESTREAM SOFTENING Annual Report, 15 May 1977 - 15 May 1978
Jack V. Matson 1978 81 p refs Workshop held at Houston, Tex., 1-2 Jun. 1978
(Grant NSF AEN-77-06504)
(PB-285988/2; NSF/RA-780119; AR-1) Avail: NTIS HC A05/MF A01 CSCL 13A

Heat, toxic chemicals, and organic and inorganic materials were contained in the blowdown. A methodology was defined for preliminary design upon which estimates of equipment sizes and chemical needs can be made, based only on knowledge of the makeup water quality and certain cooling water system parameters. In addition to sections on cooling water systems, cooling water chemistry and softening chemistry, design examples and a recarbonation option are presented. Of the processes under most active consideration (lime-soda softening, reverse osmosis, brine concentrators, thermal softening, ion exchanges, and electrodialysis), it appears that only the lime-soda method is economically feasible. GRA

N79-14251# National Technical Information Service, Springfield, Va.
WIND EFFECTS. PART 2: GENERAL STRUCTURES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Oct. 1978
Guy E. Habercom, Jr. Nov. 1978 123 p Supersedes NTIS/PS-77/1064; NTIS/PS-76/0950; NTIS/PS-75/871 (NTIS/PS-78/1208/4; NTIS/PS-77/1064; NTIS/PS-76/0950; NTIS/PS-75/871) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

A bibliography containing 118 abstracts concerning the effects of wind forces on structural domes, cylinders, ships, towers, antennas, and highway signs is presented. GRA

N79-14252# National Technical Information Service, Springfield, Va.
WIND EFFECTS. PART 2: GENERAL STRUCTURES. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Oct. 1978
Guy E. Habercom, Jr. Nov. 1978 260 p Supersedes NTIS/PS-77/1066; NTIS/PS-76/0952 (NTIS/PS-78/1210/0; NTIS/PS-77/1066; NTIS/PS-76/0952) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

A bibliography containing 256 abstracts concerning structural domes and shells, cables and electrical wires, chimneys, cooling towers, storage tanks, and antennas exposed to wind pressure is presented. GRA

N79-14253# PFR Engineering Systems, Inc., Marina Del Rey, Calif.
OPTIMIZATION OF DESIGN SPECIFICATIONS FOR LARGE DRY COOLING SYSTEMS Final Report, Jun. 1975 - Jun. 1978
Tzvi Rozenman, James M. Fake, and Joseph M. Pundyk Jul. 1978 315 p refs
(Contract EPA-68-03-2215)
(PB-285924/7; EPA-600/7-78-152) Avail: NTIS HC A14/MF A01 CSCL 13A

A multivariate, nonlinear, constrained optimization technique searched for the combination of design variables to determine the cooling system with the lowest annual cost. Rigorous formulations were used in calculating heat transfer and fluid flow. All thermal and mechanical design variables of the cooling system components were analyzed. Thermal variables included ambient air temperature, condenser terminal temperature difference. Module variables were tube length, number of rows and passes, and fan power. The methodology employed a computer program with major computational blocks written as subroutines. GRA

N79-14254# Rexnord, Inc., Milwaukee, Wis.
DEVELOPMENT OF A DEVICE FOR CONTINUOUS AUTOMATIC MONITORING OF CONSOLIDATION OF FRESH CONCRETE Final Report
Phillip L. Lee and Glen J. Eggert 3 Mar. 1978 104 p refs
(Contract DOT-FH-11-8588)
(PB-285966/8; FHWA/RD-78/27) Avail: NTIS HC A06/MF A01 CSCL 13C

Quality of portland cement concrete can be increased if water/cement ratios are reduced; however, this increase is only achieved if concrete is adequately consolidated. A study was conducted to develop a device to permit continuous automatic monitoring of the degree of consolidation during pavement construction. A literature search identified several candidate techniques, the most feasible being a nuclear backscatter technique to measure concrete density. A prototype instrument was developed with a 500mCi source of cesium (137) and a sodium iodide/photomultiplier sensing unit. GRA

N79-14255# Cornell Univ., Ithaca, N. Y. Dept. of Structural Engineering.
SHEAR TRANSFER IN THICK WALLED REINFORCED CONCRETE STRUCTURES UNDER SEISMIC LOADING Final Report
Richard N. White and Peter Gerely May 1978 248 p refs
(Grant NSF ATA-73-03178)
(PB-285970/0; NSF/RA-780168) Avail: NTIS HC A11/MF A01 CSCL 13M

Experiments on large specimens of cracked concrete were conducted. Various types of shear transfer were studied for a wide range of variables. It was found that the behavior of concrete and steel in the structure can be predicted with reasonable accuracy. A simplified model of this behavior is being completed. The computer-based analysis program gives reliable predictions of forces, stresses, overall deformations, and displacements of thick-walled concrete structures subjected to earthquake forces. From these studies, it is possible to rely upon some shear transfer capacity from the combination of normal vertical and horizontal steel and the inherent roughness of the crack surface in the concrete in reinforced containment vessels and similar structures. GRA

N79-14256# IIT Research Inst., Chicago, Ill.
THE USE OF NUMERICAL CONTROL TECHNOLOGY IN SMALL METALWORKING PLANTS Final Report
Jul. 1978 53 p
(PB-285779/5; J6425-FR) Avail: NTIS HC A04/MF A01 CSCL 13H

Numerical control of metalworking machines and flexible manufacturing systems could help raise metalworking productivity. These systems permit automation of small-lot production and more variety in design than mass production allows. This report

identifies three major barriers aside from market factors that have prevented more small firms from adopting numerical control techniques: the inability of small manufacturers to test objectively the new techniques on their own products, independently from the vendor; the difficulty of measuring the indirect benefits of automated equipment, such as the value of flexibility to a small firm; and the fear of too much costly downtime, because complex machinery cannot be repaired quickly. GRA

N79-14257# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: PHYSICAL SCIENCES AND TECHNOLOGY, NO. 55

1 Dec. 1978 68 p refs Transl. into ENGLISH from various Russian journals

(JPRS-72351) Copyright. Avail: NTIS HC A04/MF A01

The document is divided into three categories: (1) cybernetics, computers and automation technology; (2) engineering and equipment; and (3) physics. In the first category papers are presented on: machine tool digital control program preparation; automated control system development; description of data transmission system; problems of efficiency; and American analogs to Soviet integrated circuits. In the second category reports are given on: the possibility of a logical control law for an optomechanical scanner; statistical analysis of photoelectric multipliers; and a method of error correction in integrating digital measuring devices. The third category describes; a helium-neon laser; plasma cutting and welding; a laser microscope; and Raman spectroscopy. For individual titles, see N79-14258 through N79-14265.

N79-14258# Joint Publications Research Service, Arlington, Va.

MACHINE TOOL DIGITAL CONTROL PROGRAM PREPARATION AT MINSK CENTER c37

M. Zhadovich *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 1-5 Transl. into ENGLISH from Prom. Belorussii (Minsk), no. 8, 1978 p 60-62 (For primary document see N79-14257 05-31)

Copyright. Avail: NTIS HC A04/MF A01

An efficient way to automate series production today is to introduce machine tools and other equipment with digital program control (DPC). They expressly insure a notable increase in labor productivity, reduce the time for assimilation of new products, raise the culture of production, and create the prerequisites for full automation of industrial processes using computer technology. Widespread introduction of DPC equipment also frees a considerable number of production workers which is exceptionally important today. That is why the Tenth Five-Year Plan calls for increasing the output of DPC machine tools by not less than a factor of 2.2 while simultaneously expanding the types and making further improvements in their design. The organizational, economical and component factors which will aid in the preparation of this program are discussed. G.Y.

N79-14259# Joint Publications Research Service, Arlington, Va.

AUTOMATED CONTROL SYSTEM DEVELOPMENT c63

Robert Sergeyevich Sedegov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 6-13 Transl. into ENGLISH from Prom. Belorussii (Minsk), no. 8, 1978 p 63-68 (For primary document see N79-14257 05-31)

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An article is presented on the planning for improvements in the automated control system for industrial production. The economic, component, organizational and technical factors involved in the development of such a system are discussed. G.Y.

N79-14260# Joint Publications Research Service, Arlington, Va.

STATEWIDE DATA TRANSMISSION SYSTEM DESCRIBED c32

N. V. Talyzin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 14-19 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 36, Sep. 1978 7 p (For primary document see N79-14257 05-31)

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An important role in the further expansion of existing automatic control systems (ASU's) and those under development belongs to communications. The Statewide Data Transmission System (OGSPD) should make it possible to transmit data from a broad range of enterprises, institutions and organizations, as well as enabling computer centers to communicate with each other and with subscriber points. The OGSPD will be implemented in several stages. The first stage is that of satisfying the top priority requirements of subscribers to the network of nonswitched communication lines and also the network of collective use points. The second stage will be the additional development of specialized data transmission networks with switched channels. The third stage will be the introduction of a supplementary digital data transmission network with switched channels (with time sharing) and switching stations(with time switching). G.Y.

N79-14261# Joint Publications Research Service, Arlington, Va.

PROBLEMS ON EFFICIENT INTRODUCTION OF ASU'S CITED c63

S. Salimov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 20-29 Transl. into ENGLISH from Ekon. i Zhizn (Tashkent), no. 4, 1978 p 51-56 (For primary document see N79-14257 05-31)

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During the 9th Five-Year Plan and during the first two years of the 10th Five-Year Plan more than 90 automated control systems (ASU's) were created and introduced at enterprises and in the ministries of Uzbekistan. The experience in creating ASU's shows they represent an important potential for enhancing the effectiveness production. It is noted that there still exists considerable potential for further reducing cost and increasing effectiveness of functioning and newly planned systems. An attempt is made to uncover this potential by examining the factors reducing the effectiveness of ASU's. G.Y.

N79-14262# Joint Publications Research Service, Arlington, Va.

THE POSSIBILITIES OF A LOGICAL CONTROL LAW FOR AN OPTOMECHANICAL SCANNER c35

V. G. Vyskub, S. V. Galuyev, V. B. Zadernyuk, B. S. Rozov, V. I. Savelyev, and P. I. Savostin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 31-36 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 21, no. 8, 1978 p 89-93 (For primary document see N79-14257 05-31)

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A logical law of control of an optomechanical scanning system with an interference angular displacement sensor is described. Its capabilities for controlling the scanner during the readout of graphic information from a digital computer are analyzed. The logic control law uses information only about the signs and rate of positional error. G.Y.

N79-14263# Joint Publications Research Service, Arlington, Va.

STATISTICAL ANALYSIS OF PHOTOELECTRIC MULTIPLIERS c35

K. N. Shchelkunov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 37-43 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 21, no. 8, 1978 p 94-99 (For primary document see N79-14257 05-31)

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A procedure for the statistical analysis of PEM (photoelectric multipliers) using generating functions of digital distributions of photons, photoelectrons and secondary electrons is examined. A method of the regular construction of the generating function of the output signal for different distributions of the input signal, which takes into account fluctuations of the multiplication factors, losses and paths of the electrons in the dynode system of PEM and examples of the application of this method are presented. The fundamentals of the statistical analysis of PEM are presented and important qualitative conclusions and quantitative relations are derived. G.Y.

N79-14264# Joint Publications Research Service, Arlington, Va.

A METHOD OF ERROR CORRECTION IN INTEGRATING DIGITAL MEASUREMENT DEVICES **c60**
Ye. D. Baran *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 44-49 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 21, no. 4, Apr. 1978 p 14-19 (For primary document see N79-14257 05-31)
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An algorithm for automatic error correction in an integrating digital voltmeter based on a linear voltage-to-frequency converter without a common feedback circuit is studied. G.Y.

N79-14265# Joint Publications Research Service, Arlington, Va.
PLASMA CUTTING AND WELDING **c75**
V. Orlov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 51-60 Transl. into ENGLISH from Tekhn. i Nauka (Moscow), no. 7, Jul. 1978 p 2-5 (For primary document see N79-14257 05-31)
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The general design of plasmatrons (plasma apparatus), the elements and the mechanisms (techniques) used in their operations, are discussed. Plasma technology applications in industrial production is emphasized. G.Y.

N79-14791# Joint Publications Research Service, Arlington, Va.
METHODS OF ENGINEERING REALIZATION OF READ OUT DEVICES FOR PLANE MAGNETIC DOMAINS
N. P. Vasilyeva, O. A. Sedykh, and O. M. Fioshkina *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 53-65 refs Transl. into ENGLISH from Prib. Sist. Upr. (Moscow), no. 6, Jul. 1978 p 15-18 (For primary document see N79-14783 05-59)
Copyright. Avail: NTIS HC A04/MF A01

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N79-14266 Commonwealth Scientific and Industrial Research Organization, Mordialoc (Australia). Div. of Atmospheric Physics.
UHF RADIOSONDE RECEIVER
I. G. Bird 1977 22 p refs
(CSIRO-TR-31; ISBN-0-643-00266-9) Copyright. Avail: Issuing Activity

A UHF radiosonde receiver is described. Its features include simplicity of design, low cost and low power consumption. Detailed circuitry, operating instructions and alignment procedures are presented. G.Y.

N79-14267* National Aeronautics and Space Administration. Pasadena Office, Calif.
DIGITAL DEMODULATOR-CORRELATOR Patent
James W. Layland (JPL), Warren L. Martin (JPL), Arthur I. Zygielbaum (JPL), Richard M. Goldstein (JPL), and William P. Hubbard, inventors (to NASA) (JPL) Issued 5 Sep. 1978 14 p Filed 29 Mar. 1977 Supersedes N77-24341 (15 - 15, p 1977) Sponsored by NASA
(NASA-Case-NPO-13982-1; US-Patent-4,112,497;
US-Patent-Appl-SN-782464; US-Patent-Class-364-728;
US-Patent-Class-329-122; US-Patent-Class-343-14;
US-Patent-Class-364-458; US-Patent-Class-364-604) Avail: US Patent and Trademark Office CSCL 17B

An apparatus for demodulation and correlation of a code modulated 10 MHz signal is presented. The apparatus is comprised of a sample and hold analog-to-digital converter synchronized by a frequency coherent 40 MHz pulse to obtain four evenly spaced samples of each of the signal. Each sample is added or subtracted to or from one of four accumulators to or from the separate sums. The correlation functions are then computed. As a further feature of the invention, multipliers are each multiplied by a squarewave chopper signal having a period that is long relative to the period of the received signal to foreclose contamination of the received signal by leakage from either of the other two terms of the multipliers.

Official Gazette of the U.S. Patent and Trademark Office

N79-14268* National Aeronautics and Space Administration. Pasadena Office, Calif.
AZIMUTH CORRELATOR FOR REAL-TIME SYNTHETIC APERTURE RADAR IMAGE PROCESSING Patent
Wayne E. Arens, inventor (to NASA) (JPL) Issued 2 Jan. 1979 10 p Filed 18 Oct. 1977 Supersedes N78-11266 (16 - 02, p 0180) Sponsored by NASA
(NASA-Case-NPO-14019-1; US-Patent-4,132,989;
US-Patent-Appl-SN-843308; US-Patent-Class-343-5CM;
US-Patent-Class-343-100CL) Avail: US Patent and Trademark Office CSCL 17I

An azimuth correlator architecture is defined wherein a number of serial range-line buffer memories are cascaded such that the output stages of all buffer memories together form a complete and unique range bin in the azimuthal dimension at any given time. A range bin is automatically read out of the last stages of the registers in parallel on a range line sample-by-sample basis for subsequent range migration correction and correlation. Range migration correction is performed on the range bins by effectively varying the length of a delay register at the output of each range-line buffer memory. The corrected range bin output from the delay registers is then correlated with a Doppler reference function to form an image element on a real-time basis.

Official Gazette of the U.S. Patent and Trademark Office

N79-14269 British Broadcasting Corp., Kingswood (England). Engineering Div.
CARFAX TRAFFIC INFORMATION SERVICE: PRELIMINARY FIELD ASSESSMENT OF THE RING SYSTEM
M. J. Kallaway Nov. 1978 12 p refs
(BBC-RD-1978/30) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The activation of a motorist's receiver by the strongest signal available from a group of local transmitters by making use of the FM capture effect in conjunction with an FM signalling system is proposed for a traffic information system. The extent of the service area of each transmitter is determined by the ratio of the signal strength to that of the surrounding transmitters. Field measurements were conducted to determine the accuracy with which service area boundaries could be positioned in place and the effect of local influences on the ratio of the signal strengths received by two transmitters. In general, signal strengths received from both transmitters were not affected by local influences. Even in the worst cases, the unevenness of the boundaries should never extend over more than a few kilometers. A.R.H.

N79-14270 British Broadcasting Corp., Kingswood (England). Engineering Div.
CARFAX TRAFFIC INFORMATION SERVICE: AN ANALYSIS OF THE CHARACTERISTICS OF THE RING SYSTEM AND RECEIVER ACTIVATION
M. J. Kallaway Nov. 1978 13 p refs
(BBC-RD-1978/31) Avail: RRC, Kingswood Warren, Tadworth, Surrey, England

A modified form of the original proposal for a traffic information service known as the ring system is described. In the ring system, the motorist's receiver selects the strongest signal available from local transmitters by making use of the FM capture effect in conjunction with an FM signalling system. It is concluded that the system should perform well in practice, with low-cost receivers. The nature of the system also allows the effective service areas of transmitters to be controlled. G.G.

N79-14271 British Broadcasting Corp., Kingswood (England). Engineering Div.
CARFAX TRAFFIC INFORMATION SERVICE: A GENERAL DESCRIPTION OF THE RING SYSTEM
S. M. Edwardson Nov. 1978 11 p refs
(BBC-RD-1978/29) Avail: BBC, Kinswood Warren, Tadworth, Surrey, England

The proposed CARFAX traffic information system is described. A problem encountered with an earlier proposal is discussed, and the ring system as a possible solution to this problem is elaborated. The features and options of the ring system are generalized. G.G.

N79-14272*# National Aeronautics and Space Administration. Pasadena Office, Calif.
RADIO FREQUENCY ARRAYING METHOD FOR RECEIVERS Patent Application
Milton H. Brockman (JPL) and Mahlon F. Easterling, inventors (to NASA) (JPL) Filed 31 Oct. 1978 29 p Sponsored by NASA
(Contract NAS7-100)
(NASA-Case-NPO-14328-1; NASA-Case-NPO-14579-1; NASA-Case-NPO-14590-1; US-Patent-Appl-SN-956160) Avail: NTIS HC A03/MF A01 CSCL 17B

A method for arraying receiving systems is presented in order to increase the sensitivity of a receiving facility for coherent radio frequency reception with exemplary applications to high rate telemetry reception, low rate telemetry reception and radiometric tracking, as well as a special application to diversity systems using right and left circular, or vertical and horizontal linear transmissions. The basic novelty of the invention resides in RF carrier tracking at the first mixer of all receiving systems slaved to one, and differential RF carrier relative to the master cancellation in the second IF mixer by phase tracking in the slaved systems separately using the second mixer. NASA

N79-14273*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VOYAGER ELECTRONIC PARTS RADIATION PROGRAM. VOLUME 2: TEST REQUIREMENTS AND PROCEDURES
Alan G. Stanley, Keith E. Martin, and William E. Price 15 Dec. 1978 98 p
(Contract NAS7-100)
(NASA-CR-157844; JPL-Pub-77-41-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 20N

Documents are presented outlining the conditions and requirements of the test program. The Appendixes are as follows: appendix A -- Electron Simulation Radiation Test Specification for Voyager Electronic Parts and Devices, appendix B -- Electronic Piece-Part Testing Program for Voyager, appendix C -- Test Procedure for Radiation Screening of Voyager Piece Parts, appendix D -- Boeing In Situ Test Fixture, and appendix E -- Irradiate - Anneal (IRAN) Screening Documents. L.S.

N79-14274# Royal Aircraft Establishment, Farnborough (England).
MICROWAVE SCATTERING FROM THE SEA SURFACE
Volker Stein Feb. 1978 91 p refs Transl. into ENGLISH of "Zur streuung von mikrowellen an meeresoberflaechen", Rept. DLR-FB-77-09 DFVLR Inst. fuer Flugfunk und Mikrowellen Oberpfaffenhofen, 1977
(RAE-Lib-Trans-1956; BR65532) Avail: NTIS HC A05/MF A01

Models of the ocean surface and their use to describe the scattering of microwave energy from the sea are presented with particular reference to satellite microwave remote sensing. The description and derivation of the scatter cross-section per unit area is developed for a facet model for composite surfaces. The model is expanded to incorporate the hydrodynamic interaction between winds and waves. An approximate solution to a boundary value problem is obtained for an ideally conductive time invariant, slightly rough surface for both infinite and finite oceans. The limitations of the models are discussed. Author

N79-14275*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN OF A VIDEO TELECONFERENCE FACILITY FOR A SYNCHRONOUS SATELLITE COMMUNICATIONS LINK
Michael D. Richardson Jan. 1979 20 p refs
(NASA-TP-1376; E-9202) Avail: NTIS HC A02/MF A01 CSCL 17B

The system requirements, design tradeoffs, and final design of a video teleconference facility are discussed, including proper lighting, graphics transmission, and picture aesthetics. Methods currently accepted in the television broadcast industry are used in the design. The unique problems associated with using an audio channel with a synchronous satellite communications link are discussed, and a final audio system design is presented. Author

N79-14276*# National Aeronautics and Space Administration. Pasadena Office, Calif.
DISCRIMINATOR AIDED PHASE LOOK ACQUISITION FOR SUPPRESSED CARRIER SIGNALS Patent Application
Lansing M. Carson (JPL) and F. Elvin Krasin, inventor (to NASA) (JPL) Filed 15 Dec. 1978 13 p Sponsored by NASA
(NASA-Case-NPO-14311-1; US-Patent-Appl-SN-969762) Avail: NTIS HC A02/MF A01 CSCL 17B

Costas loops, and more particularly, modifications of the Costas loop, are developed in suppressed carrier receivers employed for carrier acquisition and tracking. The novelty resides in the control of the Q-channel low-pass filter to provide a wide bandwidth for carrier acquisition, and in the switch control of the loop filter for the different modes used in the successive steps for PN search and acquisition, carrier acquisition and carrier tracking. NASA

N79-14277*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FREQUENCY TRANSLATING PHASE CONJUGATION CIRCUIT FOR ACTIVE RETRODIRECTIVE ANTENNA ARRAY Patent Application
Ralph C. Chernoff, inventor (to NASA) (JPL) Filed 29 Dec. 1978 26 p
(Contract NAS7-100)
(NASA-Case-NPO-14536-1; US-Patent-Appl-SN-974471) Avail: NTIS HC A03/MF A01 CSCL 20N

A frequency translating phase conjugation circuit (PCC) for active retrodirective antenna arrays, particularly for large arrays which require exact conjugation to avoid squint of the retrodirected beam is presented. The novelty resides in the PCC which yields exact frequency translation and which is free of mixer degeneracy problems. The PRR is also novel, and like the PCC, is exact and free from mixer degeneracy. NASA

N79-14278*# National Aeronautics and Space Administration. Pasadena Office, Calif.
REAL-TIME MULTIPLE-LOOK SYNTHETIC APERTURE RADAR PROCESSOR FOR SPACECRAFT APPLICATIONS Patent Application
Chialin Wu (JPL) and Vance C. Tyree, inventors (to NASA) (JPL) Filed 15 Dec. 1978 28 p
(Contract NAS7-100)
(NASA-Case-NPO-14054-1; US-Patent-Appl-SN-969761) Avail: NTIS HC A03/MF A01 CSCL 17I

A synthetic multiple-look aperture radar (SAR) for spacecraft is reported. Excess azimuth bandwidth in radar echo signals is used to produce multiple-look SAR images and to provide real-time analysis of the antenna electric boresight. NASA

N79-14279# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SIMPLIFIED COMPUTER METHOD FOR LONG-TERM CALCULATION OF HF SKY-WAVE CIRCUITS
A. A. E. Picquenard (Institution Technologico de Aeronautica, Sao Jose dos Campos, Brazil) and Eurico R. dePaula Oct. 1978 17 p refs Submitted for publication
(INPE-1377-PE/175) Avail: NTIS HC A02/MF A01

A program is described which is intended to supply the necessary information to the designer of HF radio stations. The aim of the paper is to transform qualitative ideas of the problem into numerical values, to allow the designer to select frequencies, transmitter power and antenna types. The possible influence of the parameters involved are examined. G.Y.

N79-14280# Transportation Systems Center, Cambridge, Mass.
PERFORMANCE OF A Q-M/PSK DATA MODEM OPERATING IN A VOICE AND DATA MODE THROUGH THE ATS-6 SATELLITE Final Report, Jan. - Aug. 1977
J. Golab and C. B. Duncombe Feb. 1978 30 p refs
(Contract DOT-TSC-531)
(AD-A053188; TSC-FAA-77-28; FAA-RD-78-6) Avail: NTIS HC A03/MF A01 CSCL 17/2

Experiments were conducted in cooperation with the

Communications Research Center (CRC) of Canada to gather additional performance data on the error statistics of the digital data channel of the Q-M/PSK Voice and Data Modem, while operating in the hybrid (simultaneous) voice and data mode. These data are to supplement the data collected in the 1974-75 ATS-6 satellite tests to provide additional information about the performance of the data portion of the modem when operating in a gaussian noise (no multipath) environment. Flight tests were conducted from 14 to 24 March 1977, in three locations: two in Canada at a 9 deg. elevation angle to the satellite and one near Bermuda at a 5 deg. elevation angle. Signals were transmitted from the Communications Research Center ground station at L-Band (1650 MHz) to the ATS-6 where they were relayed to the aircraft at 1550 MHz and received and recorded for post-flight tests. All flight tests were successfully completed and a large amount of data were collected. Results indicate a bit error rate on the order of 2 db closer to theoretical for DECPSK than in the previous ATS-6 tests, and in close agreement with laboratory and acceptance test data. Author (GRA)

N79-14281# Input Output Computer Services, Inc., Cambridge, Mass.
SINGLE-CHANNEL VOICE-RESPONSE-SYSTEM PROGRAM DOCUMENTATION. VOLUME 2: PROGRAM-DESIGN MODULES Final Report, Sep. 1975 - Jan. 1976
Dec. 1977 70 p refs 3 Vol.
(Contract DOT-TSC-1107-2)
(AD-A051745; FAA-RD-77-177; FAA-77-24-2-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report documents the design and implementation of a Voice Response System (VRS) using Adaptive Differential Pulse Code Modulation (ADPCM) voice coding. Implemented on a Digital Equipment Corporation PDP-11/20, this VRS system supports a single audio output channel. Vocabulary size is limited to 900 words or phrases. Input to the system consists of text messages or sentences in ASCII format transmitted to the 11/20 through a 300-baud asynchronous interface. A preliminary design for a VRS for 10 channels is reported. This is the second of three volumes. Volume I is a system description, and Volume III is a user's guide. Author (GRA)

N79-14282# Input Output Computer Services, Inc., Cambridge, Mass.
SINGLE-CHANNEL VOICE RESPONSE-SYSTEM PROGRAM DOCUMENTATION. VOLUME 1: SYSTEM DESCRIPTION Final Report, Sep. 1975 - Jan. 1976
Dec. 1977 39 p refs 3 Vol.
(Contract DOT-TSC-1107-1)
(AD-A051543; FAA-RD-77-177-1-Vol-1; FAA-77-24.1-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report documents the design and implementation of a Voice Response System (VRS) using Adaptive Differential Pulse Code Modulation (ADPCM) voice coding. Implemented on a Digital Equipment Corporation PDP-11/20,R this VRS system supports a single audio-output channel. Vocabulary size is limited to 900 words or phrases. Input to the system consists of text messages or sentences in ASCII format transmitted to the 11/20 through a 300-baud asynchronous interface. A preliminary design for a VRS for 10 channels is reported. GRA

N79-14283# Input Output Computer Services, Inc., Cambridge, Mass.
SINGLE-CHANNEL VOICE-RESPONSE-SYSTEM PROGRAM DOCUMENTATION. VOLUME 3: USER'S GUIDE Final Report, Sep. 1975 - Jan. 1976
Dec. 1977 39 p refs 3 Vol.
(Contract DOT-TSC-1107)
(AD-A051157; FAA-RD-77-177.3-Vol-3; FAA-77-24.3-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report documents the design and implementation of a Voice Response System (VRS) using Adaptive Differential Pulse Code Modulation (ADPCM) voice coding. Implemented on a Digital Equipment Corporation PDP-11/20, this VRS system supports a single audio output channel. Vocabulary size is limited to 900 words or phrases. Input to the system consists of text messages or sentences in ASCII format transmitted to the 11/20 through a 300-baud asynchronous interface. A preliminary design for a VRS for 10 channels is reported. GRA

N79-14284# Transportation Systems Center, Cambridge, Mass.
PERFORMANCE RESULTS OF SOME CANDIDATE FRENCH MODEMS FOR THE AERONAUTICAL SATELLITE COMMUNICATION CHANNEL Interim Report, Jul. 1976 - Apr. 1977
C. B. Duncombe May 1978 76 p refs
(AD-A056830; TSC-FAA-78-4; FAA-RD-78-38) Avail: NTIS HC A05/MF A01 CSCL 17/2

Five candidate data, voice, and ranging modems were evaluated by the AEROSAT channel simulation facility to determine applicability for use in the aeronautical satellite communication channel for air traffic control. The modems were supplied by Telecommunications Radio-electriques et Telephoniques of Paris, France. The modems: performance were evaluated as a function of carrier to noise ratio, carrier to multipath ratio, doppler frequency, and relative Doppler frequency. The results are presented herein. Author (GRA)

N79-14285# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CONTROL OF SIDELOBES IN CYLINDRICAL ARRAYS
Kimball J. Keeping and Jean-Claude Sureau 19 Jun. 1978 20 p refs
(Contract F19628-78-C-0002; MIPR-78-19143)
(AD-A059375; TN-1978-22) Avail: NTIS HC A02/MF A01 CSCL 17/4

Low sidelobes patterns in cylindrical arrays are synthesized through the use of an artificially-created noise jammer environment: pattern/excitation pairs are generated by an exact formal process so as to maximize the signal-to-jammer noise ratio. Sidelobe levels (or beamwidth) and rate of decay are controlled by proper selection of the jammer angular distribution; this latter process is somewhat heuristic. Author (GRA)

N79-14286# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistics Research Lab.
THE 140 GHz CAPTURE ANTENNA MULTIPATH EXPERIMENT
H. Bruce Wallace Aug. 1978 47 p refs
(AD-A059712; AD-E430102; ARBRL-MR-02855) Avail: NTIS HC A03/MF A01 CSCL 17/9

As part of a study of the feasibility of a 140-GHz beamrider, measurements were made of the effect of multipath on the antenna power patterns of simulated missile capture antennas. The upper and lower lobes of two conically scanning capture antennas were simulated using 50.8-mm and 152.4-mm horn-lens antennas. Vertical field probes were made at a range of 100 m over high weeds, mowed grass and asphalt. A theoretical model for specular ground reflection compared favorably with the experimental results. On the basis of this model, it is concluded that the capture of a beamrider missile would be difficult at ranges greater than 200 m over some terrain. Author (GRA)

N79-14287# AEL Service Corp., Farmingdale, N. J.
ELECTROMAGNETIC RADIATION SYSTEM (EMRS) FOR SUSCEPTIBILITY TESTING Quarterly Report, 1 Oct. - 31 Dec. 1977
Jack M. VanArsdale Jul. 1978 41 p
(Contract DAAB07-76-C-0332)
(AD-A059862; AELSC-TR-23; CORADCOM-76-0332-5) Avail: NTIS HC A03/MF A01 CSCL 14/2

The function of the Electromagnetic Radiation System (EMRS) is to generate electromagnetic energy so as to produce a constant field strength that can be automatically scanned as a function of frequency. The design objective is to cover the frequency range of 30 hertz to 40 gigahertz with field strength intensities up to 200 volts per meter. A stripline approach is described and proposed for use as the field generating device for the lower frequencies. The use of defocused parabolas are proposed for use at the higher frequencies. The final system configuration is described including specific equipment to be used along with interface and control circuitry necessary for proper operation. Author (GRA)

N79-14288# Minnesota Univ., Minneapolis.
WAVE PROPAGATION IN NONLINEAR PARABOLIC PROBLEMS AND OTHER PROBLEMS Final Report, 16 Sep. 1977 - 15 Jun. 1978

J. B. McLeod and J. Serrin 25 Sep. 1978 11 p refs
(Grant DAAG29-77-G-0157)
(AD-A060111; ARO-14997.1-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

Contents: Convergence to travelling waves of solutions of nonlinear diffusion equations; Stability of travelling pulses of systems of reaction-diffusion equations; The relation between the inverse scattering method for nonlinear wave equations and connection problems for certain nonlinear ordinary differential equations; and Stokes' conjecture concerning the existence of a wave of greatest height and the angle of its slope. GRA

N79-14289# Naval Underwater Systems Center, New London, Conn. Submarine Electromagnetic Systems Dept.
EXTREMELY LOW FREQUENCY (ELF) FIELD STRENGTH MEASUREMENTS MADE IN CONNECTICUT DURING 1976
Peter R. Bannister 11 Sep. 1978 127 p refs
(AD-A060095; NUSC-TR-5853) Avail: NTIS HC A07/MF A01 CSCL 20/3

Horizontal magnetic field strength measurements (both amplitude and relative phase) at 76 - or- 4 Hz were made in Connecticut from August to December 1976 to further investigate sunrise, daytime, sunset, nighttime, and seasonal extremely low frequency (ELF) propagation variations. The transmission source for these 1.6 Mm range measurements was the U.S. Navy ELF Wisconsin Test Facility (WTF). The principal observations obtained from these measurements were (1) that ELF nighttime propagation is much more variable than daytime propagation, (2) that the nighttime field strength amplitude usually minimized around 0600 to 0800 GMT, whereas the nighttime relative phase maximized about an hour earlier, (3) that increases in geomagnetic activity were usually accompanied by decreases in the minimum nighttime field strength, (4) that the repetition rate between the lowest measured minimum nighttime field strengths was nearly equal to the solar rotation period, (5) that the 'Halloween effect' was observed for the seventh year in a row, (6) that the average relative phase difference between daytime and nighttime propagation conditions was 22 degrees, which corresponds to a relative phase velocity difference delta (c/v) of 0.15, (7) that phase velocity changes occurring during nighttime propagation conditions occasionally are greater than changes associated with the sunrise-sunset terminators crossing the transmitter or receiver locations, and (8) that large decreases in field strength amplitude were not accompanied by large decreases in effective atmospheric noise levels. Author (GRA)

N79-14290# General Electric Co., Syracuse, N.Y. Heavy Military Electronic Systems.
UNATTENDED RADAR STATION DESIGN FOR DEWLINE APPLICATION, VOLUME 1. EXECUTIVE SUMMARY Final Technical Report, 19 Jul. - 19 Dec. 1977
E. J. Gersten, comp., W. E. Abriel, S. E. Bell, J. R. Golden, and J. T. Gorham 19 Jan. 1978 36 p
(Contract F19628-77-C-0212)
(AD-A059721; ESD-TR-78-716-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 17/9

The Executive Summary is a very short synopsis of the 'Unattended Radar Station Design Application' study to investigate the Feasibility of utilizing a string of Unattended Radars in the Arctic. The study is conceptual relative to design, installation, operation, maintenance and support of Unattended Stations and attendant problems such as security, reliability, maintainability, availability and life cycle cost. Cost drivers and problems are identified, and potential solution alternatives with recommendations presented. The conclusion is that with reasonable development, economical Unattended Arctic Radar Stations are possible. Author (GRA)

N79-14291# General Electric Co., Syracuse, N.Y. Heavy Military Electronic Systems.
UNATTENDED RADAR STATION DESIGN FOR DEWLINE APPLICATION, VOLUME 2 Final Technical Report, 19 Jul. - 19 Dec. 1977
W. E. Abriel, S. E. Bells, E. J. Gersten, Comp., R. M. Johnson, and D. J. Murrow Jan. 1978 244 p
(Contract F19628-77-C-0212)
(AD-A059510; ESD-TR-78-176-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 17/9

This report examines the feasibility of implementing and maintaining a string of Unattended Radar Stations in the Arctic. The study is conceptual relative to design, installation, operation, maintenance, and support of Unattended Stations and attendant problems such as security, reliability, maintainability, availability, and life cycle cost. Cost Drivers are identified and potential solution alternatives with recommendations presented. The conclusion is that, with reasonable development, economical Unattended Arctic Radar Stations are possible. Author (GRA)

N79-14292# Mission Research Corp., Santa Barbara, Calif.
EFFECT OF MULTIPLE SCATTERING ON THE COMPTON RECOIL CURRENT Topical Report, Dec. 1977 - Feb. 1978
Conrad L. Longmire Feb. 1978 52 p refs
(Contract DNA001-77-C-0135)
(AD-A059914; AD-E300333; NRC-R-378; DNA-4543T) Avail: NTIS HC A04/MF A01 CSCL 20/14

This report explains the approximate method used in the CHAP EMP computer code for calculating the Compton current as affected by multiple scattering, and compares its results with those from more accurate Monte Carlo calculations. It is shown that the CHAP method provides good accuracy. Results computed by Sollfrey are also compared with the Monte Carlo results, and found to be less accurate than expected. Author (GRA)

N79-14293# Control Data Corp., Minneapolis, Minn. Image Systems Div.
STATISTICAL EVALUATION OF FOP FEATURES Final Technical Report, Jul. 1976 - Sep. 1977
L. Kirvida, D. Hanson, and L. Baumann Griffiss AFB RADC Jun. 1978 100 p
(Contract F30602-76-C-0349; AF Proj. 2037)
(AD-A060039; RADC-TR-78-108) Avail: NTIS HC A05/MF A01 CSCL 17/9

This report describes research conducted to determine the potential of automatic classification of military targets from large area surveillance radar systems. The Air Force has developed the Modular Change Detector (MCD) for performing real-time change detection using a reference and mission pair of radar images. The automatic classification experiments performed under this contract established the feasibility of automatically screening certain classes of military targets. Three automatic classification experiments were demonstrated with 100% correct classification of military equipment in operational deployment. With the incorporating of this screening technique on the output of the MCD it is possible to cue an interpreter to particular targets of interest. Such cueing helps discriminate against false alarms changes, which previous studies have shown increases the interpreters' coverage rate and his probability of detection.
Author (GRA)

N79-14294# Naval Ocean Systems Center, San Diego, Calif.
FIBER OPTICS USE IN THE P-3C AIRCRAFT. A FIBER OPTIC INTERCONNECT SYSTEM FOR COMPUTER CONTROLLED ALPHANUMERIC DISPLAYS IN A P-3C AIRCRAFT Interim Report
A. Flores 1 May 1978 15 p
(AD-A060318; NOSC/TR-272) Avail: NTIS HC A02/MF A01 CSCL 17/2

A prototype fiber optic interconnect system was developed to interface the CP-901 computer data processing unit 1 with the auxiliary readout display. Installation aboard a P-3C test aircraft and a proposed long term test program are discussed.
Author (GRA)

N79-14295# Naval Ocean Systems Center, San Diego, Calif.
LINEAR PREDICTIVE SPECTRAL ESTIMATION OF BAND-LIMITED SIGNALS IN LOWPOWER NOISE Research Report, Jan. 1977 - Apr. 1977
S. T. Alexander and E. H. Satorius 31 Mar. 1978 20 p
(XF11101110)
(AD-A059543; NOSC/TR-232) Avail: NTIS HC A02/MF A01 CSCL 12/1

The discrete Wiener matrix equation is solved for the case of a complex bandlimited (BL) signal corrupted by additive lowpass correlated noise. The solution is achieved by the method of undetermined coefficients which significantly reduces the

dimensionality of the problem. Asymptotic properties of the minimum mean-square error (MMSE) weight vector solutions are examined for the cases of very long filter lengths and degeneration to white noise. These special cases allow the MMSE filter impulse response to be examined in terms of its noise and signal components. It is then shown that by proper choice of prediction distance Delta, one may remove much of the noise effects upon the MMSE filter while retaining the desired BL signal characteristics. Author (GRA)

N79-14296# Oregon State Univ., Corvallis. Dept. of Electrical and Computer Engineering.

ADVANCED FORWARD AREA TACTICAL RADAR NETWORK Final Report

John D. Spragins Jul. 1978 12 p

(Grant AF-AFOSR-3339-77; AF Proj. 2304)

(AD-A059934; AFOSR-78-1339TR) Avail: NTIS HC A02/MF A01 CSCL 17/9

Work done under the cited grant since preparation of an interim report dated 12/15/77 (the primary grant report) is described. The documented work consisted primarily of development of a GPSS simulation model for the radar network, which will be one of the major research tools used during continuation work under grant number 78-3619. Author (GRA)

N79-14297# General Electric Co., Syracuse, N.Y. Electronic Systems Div.

UNATTENDED RADAR STATION DESIGN FOR DEWLINE APPLICATION Final Report, 19 Jul. - 19 Dec. 1977

W. E. Abriel, S. E. Bell, J. R. Golden, J. T. Gorham, R. M. Johnson, and E. J. Gersten, comp. Hanscom AFB, Mass. ESD 19 Jan. 1978 253 p

(Contract F19628-77-C-0212)

(AD-A060061; ESD-TR-78-176-Vol-3) Avail: NTIS HC A12/MF A01 CSCL 17/9

This report examines the feasibility of implementing and maintaining a string of Unattended Radar Stations in the Arctic. The study is conceptual relative to design, installation, operation, maintenance, and support of Unattended Stations and attendant problems such as security, reliability, maintainability, availability, and life cycle cost. Cost Drivers are identified and potential solution alternatives with recommendations presented. The conclusion is that, with reasonable development, economical Unattended Arctic Radar Stations are possible. Author (GRA)

N79-14298# Ohio State Univ., Columbus. Electroscience Lab.

HIGH FREQUENCY SURFACE CURRENT AND CHARGE DENSITIES INDUCED ON AIRCRAFT BY A PLANE ELECTROMAGNETIC WAVE

C. L. Yu and W. D. Burnside Mar. 1978 159 p refs

(Contract F29601-75-C-0086)

(AD-A059810; AD-E200173; AFWL-TR-77-155) Avail: NTIS HC A08/MF A01 CSCL 20/14

Surface current and charge densities induced on aircraft fuselage by an electromagnetic plane wave of arbitrary incidence at high frequencies is the object of this research. The primary goal of this investigation is to develop a theoretical solution for predicting the induced surface and charge densities on aircraft fuselage in an accurate and efficient manner. Since it is a study of general-type aircraft, the aircraft is modeled in its most basic form. The fuselage is assumed to be an infinitely long, perfectly conducting elliptic cylinder in its cross-section and a composite elliptic cylinder in its elevation profile. The wing, cockpit, stabilizers (horizontal and vertical) and landing gear are modeled by n sided bent or flat plates which can be arbitrarily attached to the fuselage. The solution developed in this study utilizes two elliptic cylinders, namely, the roll plane and elevation plane models to approximate the principal surface profile (longitudinal and transverse) at the observation location. With the belt concept and the aid of appropriate coordinate system transformations the solution can be used to predict the surface current and charge densities induced on the fuselage in an accurate and efficient manner. The radiation patterns due to infinitesimal monopole and slot antennas on aircraft are related to the surface current and charge densities induced on the antenna location via the reciprocity theorem. Author (GRA)

N79-14299# Institute for Telecommunication Sciences, Boulder, Colo.

PREDICTING THE POWER REQUIREMENTS OF HIGH-FREQUENCY IONOSPHERIC TELECOMMUNICATION CIRCUITS

Rayner K. Rosich Apr. 1969 77 p refs Sponsored in part by Naval Electronic Systems Command

(AD-A059379; ITS-169) Avail: NTIS HC A05/MF A01 CSCL 17/2

An algorithm is presented which permits calculation of the transmitter power required to achieve a given value of circuit reliability or service probability and time availability on high-frequency ionospheric telecommunication systems. The accuracy of the algorithm is demonstrated by direct calculations and by comparison of the results of the power prediction method with predictions prepared with the present prediction program. Various formats available for the display of the results are presented. Author (GRA)

N79-14300# Naval Ocean Systems Center, San Diego, Calif.

CALCULATED ELECTRIC NEAR FIELDS ON NAVY SHIPBOARD HF ANTENNAS, ELECTRIC NEAR FIELDS OF TRUSSED-WHIP, TWIN-WHIP, DISCONE-CAGE, AND BOTTOM-FED FAN ANTENNAS Final Report, Jul. 1977 - Jan. 1978

J. C. Logan and J. W. Rockway 16 Mar. 1978 66 p refs

(AD-A059906; NOSC/TD-168) Avail: NTIS HC A04/MF A01 CSCL 09/5

This report presents the electric near fields of the trussed-whip, twin-whip, discone-cage, and bottom-fed fan shipboard hf antennas. It also discusses the importance of the electric near fields of hf transmitting antennas to the Navy; the analytic approach used; the near field characteristics of hf antennas on an extended ground plane; and the near field characteristics of hf antennas in a structured environment. The final section develops a near field extrapolation algorithm with which the calculated near fields for antennas on an extended ground plane can be used to predict a bound on the near fields that will occur in a shipboard environment for these hf transmitting antennas. Author (GRA)

N79-14301# Ohio State Univ., Columbus. Electroscience Lab.

MOMENT METHOD CALCULATION OF REFLECTION COEFFICIENT FOR WAVEGUIDE ELEMENTS IN A FINITE PLANAR PHASED ANTENNA ARRAY Ph.D. Thesis

A. J. Fenn, G. A. Thiele, and B. A. Munk Sep. 1978 249 p refs

(Contract N00014-76-C-0573)

(AD-A060071; ESL-784372-71) Avail: NTIS HC A11/MF A01 CSCL 09/1

A technique is presented for determining the aperture reflection coefficients for E-plane and H-plane scanned finite planar phased antenna arrays. The array elements are rectangular waveguide-fed apertures arranged in either a rectangular or triangular lattice and are located in an infinite ground plane. The formulation is such that an iris may be present at the waveguide-half space junction and the waveguides may be completely filled with dielectric. The method of moments is used to solve an integral equation for the unknown equivalent magnetic current distribution of each aperture. GRA

N79-14302# Defense Communications Engineering Center, Reston, Va.

EMP, LIGHTING, AND POWER TRANSIENTS: THEIR THREAT AND RELATIONSHIP TO FUTURE EMP STANDARDS

C. L. Stansberry Nov. 1977 41 p refs

(AD-A058404; AD-E100090; DCEC-TN-22-77) Avail: NTIS HC A03/MF A01 CSCL 17/2

A general description of high-altitude EMP phenomena is given, as well as a characterization of the EMP radiated field in relation to worst-on-worst case parameters. EMP effects on electronics are compared with those of lightning, since lightning produces similar effects. Power line transients are also discussed. The use of lightning and power line transient protection specifications, with modifications, for developing EMP protection specifications is proposed. GRA

N79-14303# Rome Air Development Center, Griffiss AFB, N.Y.
AN INTRODUCTION TO THE GENERAL ELECTROMAGNETIC MODEL FOR THE ANALYSIS OF COMPLEX/SYSTEMS (GEMACS) Technical Report, 1 Apr. 1977 - 1 Jun. 1978
Kenneth R. Siarkiewicz Sep. 1978 286 p refs
(AD-A060319; RADC-TR-78-181) Avail: NTIS HC A13/MF A01 CSCL 09/5

This report contains a detailed introduction to the General Electromagnetic Model for the Analysis of Complex Systems (GEMACS). It contains a thorough discussion of all of the commands in the GEMACS executive and geometry languages and explains their use by reference to a sample problem that is explained in great detail throughout the document. Suggested uses of GEMACS are provided along with the executive command streams to exercise these capabilities. The document is meant to be the initial exposure to the user of the GEMACS analysis tool. In this it supplements the User's Manual in that the latter is written more in the form of a handbook to be used as a reference on the format of the various commands.

Author (GRA)

N79-14304# National Bureau of Standards, Boulder, Colo. Electromagnetic Fields Div.
FEASIBILITY STUDY OF ORBITING STANDARDS PLATFORM
A. J. Estin and R. C. Baird Jun. 1978 47 p refs
(PB-286489/0; NBSIR-78-886) Avail: NTIS HC A03/MF A01 CSCL 17B

Four components of a feasibility study for a satellite-based measurement system were used for determining important operational parameters of satellite communications systems and its major subsystems. The questions of required accuracy, methods of attaining and maintaining measurement accuracy and traceability system tradeoffs, and economic impacts and benefits were addressed. GRA

N79-14260# Joint Publications Research Service, Arlington, Va.
STATEWIDE DATA TRANSMISSION SYSTEM DESCRIBED
N. V. Talyzin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 14-19 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 36, Sep. 1978 7 p (For primary document see N79-14257 05-31)
Copyright. Avail: NTIS HC A04/MF A01

N79-14790# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF MULTICHANNEL RADARS FOR MEASURING THE COORDINATES OF OBJECTS
A. P. Lukoshkin and S. S. Poddubnyy *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1979 p 41-52 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved, Radioelektron. (Kiev), v. 21, no. 4, Apr. 1978 p 5-13 (For primary document see N79-14783 05-59)
Copyright. Avail: NTIS HC A04/MF A01

N79-14988# Joint Publications Research Service, Arlington, Va.
CALCULATING THE RESISTANCE OF A STRIP CONTACT ON AN INFINITE SHEET
O. A. Fayants *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 18-20 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 95-97 (For primary document see N79-14983 05-99)
Copyright. Avail: NTIS HC A05/MF A01

N79-14990# Joint Publications Research Service, Arlington, Va.
ADAPTATION OF RADIO RECEIVER SENSITIVITY TO THE ANTENNA NOISE VALUE
V. N. Belyayev *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 25-26 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 99-100 (For primary document see N79-14983 05-99)
Copyright. Avail: NTIS HC A05/MF A01

N79-14991# Joint Publications Research Service, Arlington, Va.
SPATIAL DIVERSITY IN RECEPTION OF ELLIPTICALLY POLARIZED SIGNALS
E. S. Golovin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 27-31 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 100-103 (For primary document see N79-14983 05-99)
Copyright. Avail: NTIS HC A05/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N79-14305* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
LIGHTNING CURRENT DETECTOR Patent
Stephen F. Livermore, inventor (to NASA) Issued 5 Sep. 1978 5 p Filed 22 Sep. 1977 Supersedes N78-10435 (16 - 01, p 0065)
(NASA-Case-KSC-11057-1; US-Patent-4,112,357; US-Patent-Appl-SN-835544; US-Patent-Class-324-72; US-Patent-Class-324-102; US-Patent-Class-324-112; US-Patent-Class-324-113; US-Patent-Class-324-133) Avail: US Patent and Trademark Office CSCL 09A

An apparatus for measuring the intensity of current produced in an elongated electrical conductive member by a lightning strike for determining the intensity of the lightning strike is presented. The apparatus includes an elongated strip of magnetic material that is carried within an elongated tubular housing. A predetermined electrical signal is recorded along the length of said elongated strip of magnetic material. One end of the magnetic material is positioned closely adjacent to the electrically conductive member so that the magnetic field produced by current flowing through said electrically conductive member disturbs a portion of the recorded electrical signal directly proportional to the intensity of the lightning strike.

Official Gazette of the U.S. Patent and Trademark Office

N79-14306# Royal Aircraft Establishment, Farnborough (England).
THE MEASUREMENT OF ELECTRICAL AND MECHANICAL SCREENING OF CABLES AT HIGH FREQUENCIES
Heinz Jungfer Jun. 1978 15 p refs Transl. into ENGLISH of "Die messung der elektrischen und magnetischen schirmung von kabeln bei hohen frequenzen", Rept. Tr-41. Heinrich-Hertz-Inst. fuer Schwingungsforschung, Berlin-Charlottenburg, 1960
(RAE-Lib-Trans-1962; BR65487) Avail: NTIS HC A02/MF A01

Transfer impedance, an acceptable measure of the effectiveness of cable screening, is considered. The induced voltage generated by the current and magnetic field is detected. Relationships are derived to allow the measurement of either the complete transmitted power or its separate components from magnetic coupling, identified by transfer impedance, and electrical coupling, identified by transfer admittance. J.M.S.

N79-14307# Royal Aircraft Establishment, Farnborough (England).
EXPERIMENTAL DERIVATION OF THE EQUIVALENT CIRCUIT AND PARAMETERS OF AN IDEALISED SYNCHRONOUS MACHINE
M. Canay (Brown, Boverie und Cie, A. G., Baden, Switzerland) Jun. 1978 31 p refs Transl. into ENGLISH from Bull. Assoc. Suisse Elec. (Switzerland), v. 63, no. 20, 1972 p 1137-1146 (RAE-Lib-Trans-1978) Avail: NTIS HC A03/MF A01

The determination of the size of the protection devices required for the exciter circuit of a synchronous machine was studied by measuring the currents and voltages in the field circuit using dynamic processes. It is shown that to obtain realistic magnitudes,

the mathematical model should include not only the stator, but also the field and damping circuits. A method is given for deriving the parameters of a mathematical model for an idealized synchronous machine. F.O.S.

N79-14308*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SYSTEM FOR DISPLAYING AT A REMOTE STATION DATA GENERATED AT A CENTRAL STATION AND FOR POWERING THE REMOTE STATION FROM THE CENTRAL STATION Patent Application
James C. Perry, inventor (to NASA) Filed 30 Nov. 1978 19 p
(NASA-Case-GSC-12411-1; US-Patent-Appl-SN-965367) Avail: NTIS HC A02/MF A01 CSCL 09C

A system having a time display unit remote (up to approximately 200 ft.) from a master timing unit is presented. The remote display unit is characterized by its simplicity, low cost, small size, low energy requirements, reliability, and most importantly, its lack of a power supply. Although the invention is applicable to the remote display of data in general, it is particularly applicable to the remote display of time of day data. Novelty is believed to exist in the transmission of the data and power signals from master timing unit to the remote display unit offer a single line and to the simplicity of the circuit design employed to effect not only energization of the components at the remote unit but also to display the transmitted data. NASA

N79-14309*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPACE SHUTTLE ACTIVE-POGO-SUPPRESSOR CONTROL DESIGN USING LINEAR QUADRATIC REGULATOR TECHNIQUES
Bruce Lehtinen and Carl F. Lorenz Jan. 1979 83 p refs
(NASA-TP-1217; E-9578) Avail: NTIS HC A05/MF A01 CSCL 09C

Two methods of active pogo suppression (stabilization) for the space shuttle vehicle were studied analytically. The basis for both approaches was the linear quadratic regulator, state space technique. The first approach minimized root-mean-square pump inlet pressure by using either fullstate feedback, partial-state feedback, or output feedback with a Kalman filter. The second approach increased the modal damping associated with the critical structural modes by using either full-state feedback or reconstructed state feedback. A number of implementable controls were found by both approaches. The designs were analyzed with respect to sensitivity, complexity, and controller energy requirements, as well as controller performance. Practical controllers resulting from the two design approaches tended to use pressure and flow as feedback variables for the minimum-rms method and structural accelerations or velocities for the modal control method. Both approaches are suitable for the design of active pogo-suppression controllers. Author

N79-14310# RCA Labs., Princeton, N. J.
TRANSFERRED-ELECTRON LOGIC DEVICES FOR MULTI-GIGABIT-RATE LOGIC Final Report, 1 Dec. 1975 - 28 Feb. 1978
W. R. Curtice Sep. 1978 61 p refs
(Contract N00014-76-C-0465)
(AD-A059363; PRRL-78-CR-17) Avail: NTIS HC A04/MF A01 CSCL 09/5

The results of two-dimensional transient simulations of various types of transferred-electron logic devices (TELDs) are described. The computer programs developed are simple enough to run on any minicomputer, yet great detail of device performance is obtained. Planar GaAs logic devices are studied as simple logic gates (TELDs) utilizing a Schottky-barrier gate as an input. A logic gate formed by a FET-triggered two-terminal TED is analyzed. The waveforms of capacitive-output electrodes are developed. GaInSb logic gates, enhancement-mode TELDs, and transverse-domain-spreading devices are simulated and some difficulties with these devices are observed. The operation of an exclusive-OR circuit constructed with two TELDs is described. A simple GaAs TELD gate was shown to be capable of a gain of 1.25, a propagation delay of 26 ps, and an output rise time of 16 ps for a fan-out of 2, with a power dissipation of about 120 mW. A full adder circuit constructed with TELDs should have a propagation delay of about 100 ps. The FET-triggered-TED with capacitive-output electrodes should be suitable for logic arrays and have propagation delay and bias power similar to a TELD. All such logic arrays require input data streams that can be generated by TED interfacing circuits. Author (GRA)

N79-14311# Naval Research Lab., Washington, D. C. Microwave Technology Branch.
FABRICATION OF PMOS DIGITAL SHIFT REGISTERS Interim Report
K. L. Davis, P. R. Reid, and W. D. Baker Jun. 1978 20 p refs
(RR0210346)
(AD-A059878; AD-E000207; NRL-MR-3786) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report contains the design, fabrication process, test conditions, and test results for a digital shift register chip fabricated at the Naval Research Laboratory during 1977. The basic technology used was PMOS, silicon-gate. Four different types of shift register configurations were contained on the test chip; a static shift register, a bucket brigade device, a scanner, and a dynamic ratioless shift register. Author (GRA)

N79-14312# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
INTEGRATED CIRCUIT ELECTROMAGNETIC SUSCEPTIBILITY HANDBOOK, PHASE 3 Final Report
J. M. Roe 1 Aug. 1978 123 p refs
(Contract N60921-76-C-A030; XF54585B02)
(AD-A059442; MDC-E1929; NSWC/DL-TR-78-152) Avail: NTIS HC A06/MF A01 CSCL 09/5

The objective of this handbook is to provide system designers with integrated circuit (IC) susceptibility information in terms of microwave signals. This is the final draft of the IC Handbook. The first and second drafts of the IC Handbook were reviewed by potential users, and their comments and suggestions have been incorporated where possible. The data in this handbook includes interference and damage susceptibility levels for digital and linear ICs. Actual test data is included when available. Modeling techniques are presented for the determination of device susceptibilities where no test data is available. The handbook explains an electromagnetic vulnerability (EMV) hardening approach for electronic systems. Coupling and shielding considerations are discussed. Susceptibility reduction techniques such as component screening, the use of lossy materials, and less susceptible circuit designs are also discussed. The handbook includes a description of the automated measurement system used to measure and analyze the IC susceptibility data.
Author (GRA)

N79-14313# Canadian Commercial Corp., Toronto (Ontario).
MANUFACTURING METHODS AND TECHNIQUES FOR MINIATURE HIGH VOLTAGE HYBRID MULTIPLIER MODULES Quarterly Progress Report, 1 Apr. - 30 Jun. 1978
Michael Korwin-Pawlowski 14 Jul. 1978 52 p
(Contract DAAB07-76-C-0041)
(AD-A059769; QPR-8) Avail: NTIS HC A04/MF A01 CSCL 10/2

The results of reliability testing of rectangular and curved multipliers to the Second Engineering Sample requirements are analyzed. Further steps to improve the performance of the multipliers and optimization of the rectifiers for these devices are discussed. Author (GRA)

N79-14314# BDM Corp., Albuquerque, N. Mex.
ELECTRICAL OVERSTRESS TEST PROGRAM AND INTEGRATED CIRCUIT FAILURE MODE EVALUATION Final Report, May 1977 - Oct. 1977
R. L. Pease, D. R. Alexander, and C. R. Jenkins 26 Apr. 1978 108 p refs
(Contract DNA001-77-C-0156)
(AD-A059714; AD-E300326; BDM/TAC-77-465-TR; DNA-4467F) Avail: NTIS HC A06/MF A01 CSCL 09/5

This final report describes the SOS diode test structures which will be used for empirical investigation of electrical overstress failure. The test structures, in which important physical parameters are varied, are described in detail and a test plan is

presented for the overstress testing that will generate failure data for a sensitivity analysis of pulse power failure level as a function of junction area, epitaxial thickness, junction radius of curvature, doping level and metallization and diffusion spikes. An electrical overstress failure mode and distribution study in integrated circuits is presented. Data on over 1200 devices which were tested on previous programs was analysed to determine failure modes on DTL, RTL, TTL, ECL, MOS and linear integrated circuits. The failure distributions on over 3,000 devices from several different test programs were reviewed to identify 'mavericks.' These 'mavericks' were investigated for distinctive failure modes or unusual pre-irradiation electrical characteristics. Author (GRA)

N79-14315# Stanford Univ., Calif. Integrated Circuits Lab.
COMPUTER AIDED ENGINEERING OF SEMICONDUCTOR INTEGRATED CIRCUITS Interim Report, 1 May - 31 Oct. 1977
J. D. Meindl, K. C. Saraswat, R. W. Dutton, J. F. Gibbons, W. Tiller, J. D. Plummer, B. E. Deal, and T. I. Kamins Jul. 1978 442 p refs
(Contract DAAB07-77-C-2684; DA Proj. 1T1-61101-A-00A-00)
(AD-A059752; DELET-TR-77-2684-2) Avail: NTIS HC A19/MF A01 CSCL 09/5

Economical procurement of small quantities of high performance custom integrated circuits for military systems is severely impeded by inadequate process, device and circuit models that handicap accurate computer-aided design at low cost. The salient objective of this program is to formulate physical models of fabrication processes, devices and circuits to allow total computer-aided design of custom large-scale integrated circuit subsystems to reduce development cycle time and cost. The basic areas under investigation are: (1) ion implantation and diffusion of dopants; (2) thermal oxidation; (3) chemical vapor deposition of silicon epitaxy; and (4) device simulation and statistical circuit modeling. This report discusses the results of the second year of the program. Author (GRA)

N79-14316# Colorado State Univ., Fort Collins.
DEVELOPMENT OF IMPROVED DESIGN METHODS FOR DIGITAL FILTERING SYSTEMS Final Report, 1 Oct. 1975 - 30 Sep. 1977
Thomas A. Brubaker 1 Nov. 1977 199 p refs
(Contract F33615-75-C-1138)
(AD-A059868; AFAL-TR-77-207) Avail: NTIS HC A09/MF A01 CSCL 09/1

Design methods for digital filters used in discrete time control systems are described. The sampling interval is first used as a design parameter. Then new design methods for digital control algorithms that minimize multiplication requirements are developed. Interactive software for aiding the design and implementation of digital control algorithms is described. Author (GRA)

N79-14317# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Electrical Engineering.
NOISE IN CHARGE COUPLED DEVICES Interim Report, 1 Jun. 1976 - 30 Sep. 1977
James F. Detry and C. T. Sah Griffiss AFB, New York RADC May 1978 49 p refs
(Contract F19628-77-C-0138; AF Proj. 2306)
(AD-A060221; RADC-TR-78-116; SR-1) Avail: NTIS HC A03/MF A01 CSCL 09/5

The four general sources of noise in CCD are reviewed which are: signal input, signal output, dark current and trapping noise. The trapping noise in a Surface Channel CCD (SCCD) is mainly due to interface traps and is the dominant noise in this device. In the Buried Channel CCD (BCCD), the low density of bulk traps gives much less trapping noise. Theoretical RMS noise levels at the output are about 500 electrons/packet in a SCCD and 100 to 300 electrons/packet in a BCCD with comparable dynamic ranges. Noise in SCCD can be reduced by reducing interface state density during device fabrication. Author (GRA)

N79-14318# Texas Instruments, Inc., Dallas. Central Research Labs.
GRADED CHANNEL FETs FOR NAVY ELECTROMAGNETIC SYSTEMS Final Report, 30 Jun. 1976 - 30 Jun. 1978
D. W. Shaw, R. E. Williams, and E. C. Secrest Aug. 1978 91 p refs
(Contract N00014-76-C-1016)
(AD-A060350; TI-08-78-33) Avail: NTIS HC A05/MF A01 CSCL 09/1

This report summarizes the results of a program for development and evaluation of gallium arsenide field effect transistors (FETs) having graded doping profiles in the direction perpendicular to the surface. During the course of this program, such graded channel FETs were shown to be more linear than conventional FETs with flat channel doping profiles. Graded channel FETs are expected to be very beneficial for advanced microwave systems requiring highly linear solid state amplifiers. Included in the scope of the program was an analysis of the effects of graded profiles on linearity, the development and implementation of a method to grow epitaxial layers having graded profiles, fabrication and dc and rf characterization of graded channel FETs, development of a localized anodic oxidation procedure to utilize n(-) contact layers, and an objective comparison of the properties of graded channel FETs with those of conventional, uniformly doped structures. Theoretical analysis of the effect of nonuniform doping profiles showed that improved linearity is expected for profiles in which the doping concentration is greater near the active channel/buffer interface. For a given channel thickness and total doping concentration, the device having the largest 'charge moment' (the integral across the active layer of the product of doping concentration and distance from the surface) was predicted to be more linear. GRA

N79-14319# Army Engineer Topographic Labs., Fort Belvoir, Va.
DELTA PULSE CODE MODULATION COMPRESSION RELATIVE TO STEREO IMAGE MATCHING
Michael A. Crombie Sep. 1978 35 p refs
(AD-A060251; ETL-0157) Avail: NTIS HC A03/MF A01 CSCL 05/8

The effect of DPCM compression on stereo image matching is analyzed. It was determined for the aerial image used in the study that third order linear prediction is adequate and that DPCM compression does not introduce a bias in stereo matching. The standard error of mismatch for images compressed to one bit per pixel compared to 8-bit images is approximately two-thirds of a pixel spacing for each coordinate. Author (GRA)

N79-14320# Stanford Univ., Calif. Solid-State Electronics Lab.
IMPLANTATION-CONTROLLED DIFFUSION OF IMPURITIES IN COMPOUND SEMICONDUCTORS WITH APPLICATION TO THE FABRICATION OF MICROWAVE DEVICES Final Report, 1 May 1975 - 30 Apr. 1978
James F. Gibbons Aug. 1978 14 p refs
(Grant DAHC04-75-G-0156)
(AD-A059910; ARO-12923.4-EL) Avail: NTIS HC A02/MF A01 CSCL 20/12

This report summarizes research carried out under Contract DAHC04-75-G-0156. The principal results obtained were as follows: (1) A double-layer encapsulant consisting of a layer of As-doped SiO2 deposited on a layer of plasma-deposited Si3N4 was developed for annealing ion-implanted GaAs at temperatures up to 1100 C and InP at temperatures up to 900 C; (2) This encapsulant was used to study the properties of Se-implanted GaAs; (3) The two layer encapsulant was also used to study the annealing behavior of S-implanted Cr-doped InP at temperatures up to 900 C, in which an electrical activity of 68% was obtained on a sample implanted to a dose of 10 to the 14th power S(-)/sq cm at 120 keV and annealed at 900 C for 20 minutes; and (4) A two layer encapsulant composed of an evaporated layer of Ga2S3 covered by an evaporated layer of SiO2 was developed to solve special problems that arise in the annealing of S-implanted GaAs. A 100% electrical activity was obtained for ion doses up to 10 to the 13th power/sq cm, annealed at 825 C for 10 minutes. GRA

N79-14321# Toledo Univ., Ohio. Dept. of Electrical Engineering.
LABORATORY INVESTIGATION OF RECTIFIED ALTERNATOR MODEL USED IN WEIGHT MINIMIZATION STUDY, SUPPLEMENT Final Report

Thomas A. Stuart 1 Aug. 1978 98 p refs
(Grant AF-AFOSR-3413-77; AF Proj. 2305)
(AD-A059493; AFOSR-78-1293TR) Avail: NTIS HC A05/MF A01 CSCL 10/2

This report presents the results of a laboratory investigation of rectified alternator models used in an earlier study (AFOSR-76-2997). Author (GRA)

N79-14322# TRW Semiconductors, Inc., Lawndale, Calif.
MONOLITHIC 20W 2GHz TRANSISTOR AND MONOLITHIC 5W 4GHz TRANSISTOR Quarterly Report, 14 Dec. 1977 - 13 Mar. 1978
A. Harrington, William Imhauser, R. Jenkins, B. Lindgren, and G. Schreyer May 1978 52 p
(Contract DAAB07-77-C-0431; N00014-75-C-0405)
(AD-A059302; QR-3) Avail: NTIS HC A04/MF A01 CSCL 09/5

Processing of L-10 devices is proceeding, however the multilayer PIN epi is not good as desired. Work was done to characterize the epitaxial structure and correct its fabrication difficulties. SB-4000 processing is continuing and acceptable performance was achieved at 4 GHz. G.Y.

N79-14323# Air Force Geophysics Lab., Hanscom AFB, Mass.
SPACECRAFT POTENTIAL CALCULATIONS: A MODEL
Henry B. Garrett 5 May 1978 40 p refs
(AF Proj. 7661)
(AD-A060151; AFGL-TR-78-0116; AFGL-AFSG-387) Avail: NTIS HC A03/MF A01 CSCL 22/2

A simple model for calculating the potential on a spacecraft by balancing the currents to and from the spacecraft surface is developed. The model, calibrated using ATS-5 plasma data during periods when the satellite was in the earth's shadow, is used to predict potentials on a shadowed, electrically isolated surface at geosynchronous orbit as a function of local time. Potentials are also predicted as the spacecraft moves into and out of the earth's shadow. The results indicate accuracies of + or - 800 V over a range of 10,000 V. Author (GRA)

N79-14986# Joint Publications Research Service, Arlington, Va.
NEW LOGIC DETECTOR FOR TESTING MICROCIRCUITS DESCRIBED
N. I. Golovan and V. F. Litvinenko *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 12-13 Transl. into ENGLISH from Pribory i Sistemy Upr. (Moscow), no. 11, 1978 39 p (For primary document see N79-14983 05-99)
Copyright. Avail: NTIS HC A05/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N79-14324 Engineering Sciences Data Unit, London (England).
THE MOMENTUM-CHANGE COMPONENT OF PRESSURE CHANGE IN TWO-PHASE FLOW AND OTHER NON-EQUILIBRIUM EFFECTS
Aug. 1978 10 p
(ESDU-78001; ISBN-0-85679-218-7) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $194.50

One of a series of items that provides data enabling pressure losses in the flow of two phase mixtures to be calculated is presented. Because conditions may change rapidly in the direction of flow with two-phase mixtures, it is often necessary, when calculating finite changes in pressure, to carry out an integration along the flow path of locally evaluated pressure gradients. Thus each item in this series contributes towards the calculation of local pressure gradient which can itself be treated as the sum of three separate components, i.e., overall local gradient = frictional component + gravitational component + momentum-change component. ESDU

N79-14325*# Textron Bell Aerospace Co., Buffalo, N. Y.
A THREE-DIMENSIONAL TURBULENT COMPRESSIBLE FLOW MODEL FOR EJECTOR AND FLUTED MIXERS
W. L. Rushmore and S. W. Zelazny Dec. 1978 133 p refs
Sponsored by NASA
(NASA-CR-159467) Avail: NTIS HC A07/MF A01 CSCL 20D

A three dimensional finite element computer code was developed to analyze ejector and axisymmetric fluted mixer systems whose flow fields are not significantly influenced by streamwise diffusion effects. A two equation turbulence model was used to make comparisons between theory and data for various flow fields which are components of the ejector system, i.e., (1) turbulent boundary layer in a duct; (2) rectangular nozzle (free jet); (3) axisymmetric nozzle (free jet); (4) hypermixing nozzle (free jet); and (5) plane wall jet. Likewise, comparisons of the code with analytical results and/or other numerical solutions were made for components of the axisymmetric fluted mixer system. These included: (1) developing pipe flow; (2) developing flow in an annular pipe; (3) developing flow in an axisymmetric pipe with conical center body and no fluting and (4) developing fluted pipe flow. Finally, two demonstration cases are presented which show the code's ability to analyze both the ejector and axisymmetric fluted mixers. Author

N79-14326*# Aeronautical Research Associates of Princeton, Inc., N. J.
A COMPUTATIONAL MODEL FOR THE PREDICTION OF JET ENTRAINMENT IN THE VICINITY OF NOZZLE BOATTAILS (THE BOAT CODE)
Sanford M. Dash and Harold S. Pergament Dec. 1978 60 p refs
(Contract NAS1-14794)
(NASA-CR-3075) Avail: NTIS HC A04/MF A01 CSCL 20D

The development of a computational model (BOAT) for calculating nearfield jet entrainment, and its incorporation in an existing methodology for the prediction of nozzle boattail pressures, is discussed. The model accounts for the detailed turbulence and thermochemical processes occurring in the mixing layer formed between a jet exhaust and surrounding external stream while interfacing with the inviscid exhaust and external flowfield regions in an overlaid, interactive manner. The ability of the BOAT model to analyze simple free shear flows is assessed by comparisons with fundamental laboratory data. The overlaid procedure for incorporating variable pressures into BOAT and the entrainment correction employed to yield an effective plume boundary for the inviscid external flow are demonstrated. This is accomplished via application of BOAT in conjunction with the codes comprising the NASA/LRC patched viscous/inviscid methodology for determining nozzle boattail drag for subsonic/transonic external flows. A.R.H.

N79-14327*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL PERFECT-GAS STUDY OF EXPANSION-TUBE FLOW CHARACTERISTICS
Judy L. Shinn and Charles G. Miller, III Dec. 1978 88 p refs
(NASA-TP-1317; L-12407) Avail: NTIS HC A05/MF A01 CSCL 20D

Results of an experimental investigation of expansion tube flow characteristics performed with helium test gas and acceleration gas are presented. The use of helium, eliminates complex real gas chemistry in the comparison of measured and predicted flow quantities. The driver gas was unheated helium at a nominal pressure of 33 MN sq m. The quiescent test gas pressure and quiescent acceleration gas pressure were varied from 0.7 to 50 kN/sq m and from 2.5 to 53 N/sq m, respectively. The effects of tube-wall boundary layer growth and finite secondary diaphragm opening time were examined through the variation of the quiescent gas pressures and secondary diaphragm thickness. Optimum operating conditions for helium test gas were also defined. B.B.

N79-14328*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

CHARACTERISTICS OF MACH 10 TRANSITIONAL AND TURBULENT BOUNDARY LAYERS
Ralph D. Watson Nov. 1978 324 p
(NASA-TP-1243; L-12016) Avail: NTIS HC A14/MF A01 CSCL 20D

Measurements of the mean flow properties of transitional and turbulent boundary layers in helium on 4 deg and 5 deg wedges were made for flows with edge Mach numbers from 9.5 to 11.3, ratios of wall temperature to total temperature of 0.4 to 0.95, and maximum length Reynolds numbers of one hundred million. The data include pitot and total temperature surveys and measurements of heat transfer and surface shear. In addition, with the assumption of local similarity, turbulence quantities such as the mixing length were derived from the mean flow profiles. Low Reynolds number and precursor transition effects were significant factors at these test conditions and were included in finite difference boundary layer predictions. Author

N79-14329*# Cambridge Hydrodynamics, Inc., Mass.
PREDICTION OF COMPLIANT WALL DRAG REDUCTION, PART 2 Final Report
Steven A. Orszag Jan. 1979 31 p refs
(Contract NAS1-14906)
(NASA-CR-3071) Avail: NTIS HC A03/MF A01 CSCL 20D

A numerical model of turbulent boundary layer flows over compliant walls was investigated. The model is based on Burton's observation that outer flow structures in turbulent boundary layers produce large scale pressure fluctuations near the wall. The results of calculations indicate that certain small wavelength wall motions can have a significant effect upon the stability of turbulent boundary layers. J.M.S.

N79-14330*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BI-DIRECTIONAL, BURIED-WIRE SKIN-FRICTION GAGE
Hiroshi Higuchi (Dyn. Technol., Inc.) and David J. Peake Nov. 1978 27 p refs
(NASA-TM-78531; A-7637) Avail: NTIS HC A03/MF A01 CSCL 20D

A compact, nonobtrusive, bi-directional, skin-friction gage was developed to measure the mean shear stress beneath a three-dimensional boundary layer. The gage works by measuring the heat flux from two orthogonal wires embedded in the surface. Such a gage was constructed and its characteristics were determined for different angles of yaw in a calibration experiment in subsonic flow with a Preston tube used as a standard. Sample gages were then used in a fully three-dimensional turbulent boundary layer on a circular cone at high relative incidence, where there were regimes of favorable and adverse pressure gradients and three-dimensional separation. Both the direction and magnitude of skin friction were then obtained on the cone surface. Author

N79-14331*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPLORATORY INVESTIGATION OF THE EFFECT OF POROUS SURFACES ON HYPERSONIC TURBULENT BOUNDARY LAYERS
Ralph D. Watson Jan. 1979 56 p refs
(NASA-TM-78791; L-12271) Avail: NTIS HC A04/MF A01 CSCL 20D

Four different test surfaces were studied to determine the effect of porous walls on the characteristics of a hypersonic turbulent flat-plate boundary layer. The investigation was an attempt to decrease the surface shear of the boundary layer by transmitting fluctuating pressure energy through the wall and absorbing it in a cavity beneath the wall. Pitot surveys were made at two locations, schlieren photographs of the boundary layer were taken, and hot-wire measurements in the flow above the boundary layer were made to determine whether the surfaces affected the turbulent boundary layer. Neither an increase nor a decrease in surface shear or boundary-layer growth was detected. Tabulations of the pitot data are included. G.G.

N79-14332*# Old Dominion Univ. Research Foundation, Norfolk, Va.
MEASUREMENTS OF FLOW PHENOMENA INDUCED BY SUCTION THROUGH PERFORATED AND PARTIALLY PLUGGED SURFACES Progress Report, 15 Aug. 1978 - 31 Jan. 1979
Stephen P. Wilkinson and G. L. Goglia Jan. 1979 8 p
(Grant NsG-1491)
(NASA-CR-158001) Avail: NTIS HC A02/MF A01 CSCL 20D

Efforts were directed towards completing construction of the windtunnel test section, assembling instrumentation, programming the data acquisition and reduction system, adjusting the streamwise pressure gradient of the test section, calibrating the hot-wire anemometer probe, and constructing and testing a smoke generator. The test section was installed in the wind tunnel and is completely operational. The streamwise pressure gradient was adjusted to be nominally zero at a free-stream velocity of 3.05 m/s (10 ft/s). This was accomplished by adjusting the upper wall of the test section to be slightly divergent. The change in static pressure between any two streamwise locations in the test section was less than one percent of the free-stream dynamic pressure. A suitable means was found for accurately calibrating the hot-wire probe which is used to measure boundary-layer velocity profiles and fluctuating velocities. L.S.

N79-14333# Atlantic Research Corp., Gainesville, Va.
CALIBRATION PROCEDURES DEVELOPED FOR A TRIAXIAL HOT-FILM PROBE AND PRELIMINARY MEASUREMENTS OF THE VELOCITY PROFILE IN THE WAKE OF AN ISOLATED ROTOR Interim Report
L. W. Hardin and W. Hugh Hall 15 May 1978 48 p ref
Prepared in Cooperation with United Technologies Research Center, East Hartford, Conn.
(Contract F44620-76-C-0055)
(AD-A059515; NCSU/EDC-78-4; AFOSR-78-1362TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

In an experiment which was conducted to determine the response of an isolated rotor to an inlet distortion, a triaxial hot-film probe was used to make velocity and flow angle measurements near the exit plane of the rotor. The velocity sensors were three mutually orthogonal film-type sensors operated in the constant temperature mode. This probe has been calibrated and procedures have been developed to extract velocity components from the anemometer output voltages. It has been determined that the proximity of the probe shaft results in severe distortion of the flow over the velocity sensors. The process which has been developed for computing velocities yields satisfactory results in test cases and is expected to be suitable for reducing the data from limited number of flow conditions for which the probe was used in the present experiment. However, it is considered to be too involved and too susceptible to error to be used in experiments where there is either a vast amount of data to be processed or there is no means of spot-checking the results. It is, therefore, considered mandatory that an improved probe geometry be devised which does not exhibit the degree of interference observed with the probe in question before undertaking to make extensive wake measurements.
Author (GRA)

N79-14334# Naval Postgraduate School, Monterey, Calif.
THE ENHANCEMENT OF HEAT TRANSFER IN A ROTATING HEAT PIPE M.S. Thesis
Ignatius Slamet Purnomo Jun. 1978 110 p refs
(AD-A059694) Avail: NTIS HC A06/MF A01 CSCL 13/1

A linear triangular finite element formulation was used to solve the steady state two dimensional conduction heat transfer equation. A FORTRAN IV computer program of the above formulation, employing double precision arithmetic and compact storage techniques, was applied to study heat transfer in an internally finned rotation heat pipe. Results were obtained for water in a copper and stainless steel condenser with varying outside heat transfer coefficient, rotational speed, and fin angle (number of fins). Numerical results of the heat transfer rate in the copper condenser were shown to have less than 2% variance to those obtained earlier. A rotating heat pipe designed to operate with a small value of outside heat transfer coefficient experiences no significant increase of the heat transfer rate with an increase in rotational speed, since the value of the outside thermal resistance dominates. GRA

N79-14335# Dynamics Technology, Inc., Torrance, Calif.
ANALYTICAL PREDICTIONS OF BOUNDARY-LAYER TRANSITION IN A HEATED FLOW TUBE
Kent T. S. Tzou Jun. 1978 51 p refs
(Contract N00014-77-C-0005)
(AD-A059717; DT-7802-2A) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report documents a complementary analytical study to the Colorado flow-tube experiments. An improved method for analyzing boundary-layer transition in the flow tube has been developed. The method includes the effects of transverse curvature and upstream contraction on the boundary-layer development, coupled with an iterative technique to account for the displacement thickness correction to the pressure distribution in the flow tube. A series of calculations has been performed to simulate the flow-tube experiment, a heated test section with one unheated section. Further calculations indicate that a significant improvement of the tube performance may be obtained by heating of the extension tube. GRA

N79-14336# Pennsylvania State Univ., State College. Applied Research Lab.
VENTILATED CAVITY TEST OF A 3-INCH DIAMETER STREAMLINED NOSE
J. W. Holl, D. R. Stinebring, and W. R. Hall 2 Aug. 1978 33 p refs
(Contract N00017-73-C-1418)
(AD-A059525; TM-78-207) Avail: NTIS HC A03/MF A01 CSCL 20/4

A ventiliated cavity test of a 3 inch diameter streamlined nose has been conducted in the 48 inch water tunnel. Tests were conducted at 10, 20, 30 and 40 fps for dimensionless cavity lengths (L sub C/D) from approximately 1 to 4. The cavitating flow was documented by video tape and still photography. The purpose of the test was threefold namely (1) to approximate the ventilation flow rate coefficient (C sub Q) (2) to observe the stability of the pressure control system as gas was added to the flow, and (3) to observe the approximate boundary between the twin vortex regime and reentrant jet regime. The major results are (1) the ventilation flow rate coefficient is approximately 30% greater than that estimated for a quarter caliber ogive nose, (2) the pressure control system is stable and (3) the twin vortex regime is primarily confined to velocities of 10 fps and less for the gas flow rates employed in this investigation. Author (GRA)

N79-14337# Naval Research Lab., Washington, D. C.
FULLY MULTIDIMENSIONAL FLUX-CORRECTED TRANSPORT Interim Report
Steven T. Zalesak May 1978 48 p refs
(AD-A059881; AD-E000206; WRL-MR-3716) Avail: NTIS HC A03/MF A01 CSCL 20/4

An alternative formula is proposed for the flux limiting phase of the flux-corrected transport (fct) algorithms of Boris and Book. The advantages of the proposed new formula are three: trivial generalization to multidimensions without resort to time-step splitting; elimination of the clipping phenomenon for vanishing velocity; and reduction of the clipping phenomenon in a finite velocity field. The new method makes possible for the first time multidimensional FCT calculations for problems not amenable to time splitting, such as those involving incompressible or nearly incompressible flow. Author (GRA)

N79-14338# Aeronautical Research Associates of Princeton, Inc., N. J.
THEORY OF SOLITON WAVES Final Report, 1 Sep. 1977 - 31 Aug. 1978
Harvey Segur Sep. 1978 87 p refs
(Contract N00014-77-C-0610)
(AD-A059896; ARAP-358) Avail: NTIS HC A05/MF A01 CSCL 20/4

The overall objective of the work done under this contract is to determine the feasibility of using solitons, rather than sinusoidal wavetrains, as the basic building blocks in a theory of water waves. The goal of devising such a revised description is to model phenomena that occur over longer time scales than can be adequately described in terms of sinusoidal wavetrains. This report summarizes the work done in this direction during the first year of this contract. Author (GRA)

N79-14339# Pennsylvania State Univ., University Park. Applied Research Lab.
AN ANALYTICAL STUDY OF HEAT TRANSFER IN A TWO-PHASE, SOLID-LIQUID MEDIUM WITH TIME VARYING BOUNDARY CONDITIONS AT BOTH THE MOVING AND STATIONARY BOUNDARIES Final Report
Mark W. Nansteel and Carl H. Wolgemuth 7 Jun. 1978 48 p refs
(Contract N00017-73-C-1418)
(AD-A059650; TM-78-175) Avail: NTIS HC A03/MF A01 CSCL 20/13

The following report provides a brief outline and description of the steps taken in formulating a simple mathematical model for the analysis of heat transfer in a pure substance undergoing a change in phase (solid to liquid or vice-versa). The problem is approached from the differential point of view and eventually the governing equations are solved by a finite difference technique. The results show fairly conclusively that the present method of analysis is capable of predicting the behavior of such a system to a reasonably high degree of accuracy. Author (GRA)

N79-14340# Tel-Aviv Univ. (Israel). School of Engineering.
ON THE POSSIBLE RELATIONSHIP BETWEEN THE TRANSITION PROCESS AND THE LARGE COHERENT STRUCTURES IN TURBULENT BOUNDARY LAYERS
Israel J. Wygnanski 1978 28 p refs
(Grant AF-AFOSR-3275-77)
(AD-A059507; AFOSR-78-1351TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

A transitional spot, being artificially evoked in a laminar boundary layer, is shown to be related to the large scale motion in a turbulent boundary layer. The evoked spot has a universal structure which remains coherent in a turbulent boundary layer over extremely large distances. The interaction between adjacent spots in tandem has been studied and it appears that some important feature of the turbulent boundary layer may be simulated this way. A possible regeneration mechanism of the transitional spot was identified, reinforcing the notion that a transitional spot is an orderly structure which may be considered as the basic module in the turbulent boundary layer. Author (GRA)

N79-14341# Naval Postgraduate School, Monterey, Calif.
EFFECTS OF CAVITATION ON UNDERWATER SHOCK LOADING, PART 1 Interim Report, Apr. - Jun. 1978
R. E. Newton Jul. 1978 32 p refs
(MIPR-78-654)
(AD-A059972; NPS-69-78-013-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 20/4

Reported here are analytic formulations, together with one-dimensional results, in an investigation of the title subject. It is shown that either displacement or a displacement potential may be used as the basic dependent variable for a finite element analysis. Artificial damping is found to be needed to suppress spurious oscillations (a numerical phenomenon) near cavity boundaries. Adequacy of the method is demonstrated by comparison with published results of Bleich and Sandler. Some results are given for effects of cavitation on the performance of resilient attenuators. Author (GRA)

N79-14342# Flow Research, Inc., Kent, Wash.
A STUDY TO CONDUCT EXPERIMENTS CONCERNING TURBULENT DISPERSION OF OIL SLICKS Final Report, Oct. 1976 - Apr. 1978
J. T. Lin, M. Gad-el-Hak, and H. T. Liu Apr. 1978 208 p refs
(Contract DOT-CG-61688-A)
(AD-A058802; FRC-112) Avail: NTIS HC A10/MF A01 CSCL 13/2

Laboratory experiments were conducted in a wind-wave tank to study the turbulent characteristics in the water boundary-layers under the action of wind and waves and to study the oil dispersion characteristics under the action of breaking waves. Effects of an oil slick on the wind-waves or mechanically-generated waves with wind were also investigated. The objective was to understand

by means of laboratory experiments the behavior of oil dispersion in the upper ocean. Two new instruments, a laser Doppler velocimeter and a photodiode wave gauge, were developed to measure remotely the velocity and the vertical displacement of the water surface. Author

N79-14343# Mississippi State Univ., Mississippi State.
THREE-DIMENSIONAL BODY-FITTED COORDINATE SYSTEMS FOR NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATIONS **Interim Report**
C. W. Mastin and J. F. Thompson 1978 12 p refs
(Grant AF-AFOSR-2922-76)
(AD-A059357; AFOSR-78-1281TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

A finite difference procedure is described for solving the Navier-Stokes equations. The procedure is applied to the study of incompressible viscous flow about arbitrary three dimensional bodies. The difficulty of the body geometry is overcome by the use of a body-fitted curvilinear coordinate system. Implicit and partially implicity difference schemes have been programed for solving the transformed equations. Results obtained for the flow about a sphere at low and intermediate Reynolds numbers are compared with existing theoretical, numerical, and experimental results. Author

N79-14344# Battelle Pacific Northwest Labs., Richland, Wash.
MEASURED AIR FLOW RATES THROUGH MICROORIFICES AND FLOW PREDICTION CAPABILITY
S. L. Sutter, T. J. Bander, J. Mishima, and L. C. Schwendiman Jul. 1978 98 p refs
(Contract EY-76-C-06-1830)
(PB-286868/5; NUREG-CR-0066) Avail: NTIS HC A05/MF A01 CSCL 20D

Experiments performed in this study verified the applicability of classic flow relationships and calculational methodology for 'thin' orifices 20 to 200 microns in diameter. The volumetric air flow through orifices was measured (downstream pressure approximately 760 mm Hg, ambient temperature) as the upstream pressure was increased by 1 psig increments from 1 to 5 psig, 10 psig increments from 10-100 psig, and 100 psig increments from 100 to 1000 psig. Above 'choked flow' (upstream pressure approximately 13 psig) the air flow increased as a linear function of upstream pressure. Air flow rates on the same orifices exhibited a loss of flow as the temperature was increased by 200 degree increments to 1200 F. The upstream pressure was held at 15 psig, with the downstream pressure at 1 atmosphere and ambient temperature. Orifice coefficients were calculated using the experimental flow rates. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N79-14345* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INDICATED MEAN-EFFECTIVE PRESSURE INSTRUMENT **Patent**
William J. Rice, inventor (to NASA) Issued 5 Sep. 1978 5 p Filed 29 Sep. 1977 Supersedes N77-32461 (15 - 23, p 3080)
(NASA-Case-LEW-12661-1; US-Patent-4,111,041;
US-Patent-Appl-SN-837796; US-Patent-Class-73-115) Avail: US Patent and Trademark Office CSCL 14B

An apparatus for measuring indicated mean effective pressure (IMEP) of an internal combustion piston or rotary engine or of an external combustion engine such as a stirling engine is disclosed. An optical shaft encoder measures crankshaft angle of the engine. Changes in volume with respect to changes in crank angle of one or more cylinders (dV/d theta) is determined either empirically or algebraically from engine geometry and stored in a memory. As the crank angle changes, dV/d theta) is read from the memory and multiplied by chamber or cylinder pressure. The product (P dv/d theta) is then added to the total previously accumulated in the cycle. Each time theta changes by an amount equal to delta theta, the process is repeated. At the end of each engine cycle, the total is equal to the IMEP value for that cycle. Official Gazette of the U.S. Patent and Trademark Office

N79-14346* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMOCOUPLES OF MOLYBDENUM AND IRIDIUM ALLOYS FOR MORE STABLE VACUUM-HIGH TEMPERATURE PERFORMANCE **Patent**
James F. Morris, inventor (to NASA) Issued 5 Sep. 1978 5 p Filed 21 Nov. 1977 Continuation-in-part of abandoned US Patent Appl. SN-667929, filed 18 Mar. 1976
(NASA-Case-LEW-12174-2; US-Patent-4,111,718;
US-Patent-Appl-SN-853679; US-Patent-Class-136-236;
US-Patent-Class-136-202; US-Patent-Appl-SN-667929) Avail: US Patent and Trademark Office CSCL 14B

Thermocouples providing stability and performance reliability in systems involving high temperatures and vacuums by employing a bimetallic thermocouple sensor are described. Each metal of the sensor is selected from a group of metals comprising molybdenum and iridium and alloys containing only those two metals. The molybdenum, iridium thermocouple sensor alloys provide bare metal thermocouple sensors having advantageous vapor pressure compatibility and performance characteristics. The compatibility and physical characteristics of the thermocouple sensor alloys result in improved emf, temperature properties and thermocouple hot junction performance.
Official Gazette of the U.S. Patent and Trademark Office

N79-14347* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELECTRONICALLY SCANNED PRESSURE SENSOR MODULE WITH IN SITU CALIBRATION CAPABILITY **Patent**
Chris Gross, inventor (to NASA) Issued 5 Sep. 1978 10 p Filed 22 Sep. 1977 Supersedes N78-11370 (16 - 02, p 0193)
(NASA-Case-LAR-12230-1; US-Patent-4,111,058;
US-Patent-Appl-SN-835628; US-Patent-Class-73-714;
US-Patent-Class-73-4R; US-Patent-Class-73-147;
US-Patent-Class-73-721; US-Patent-Class-73-756) Avail: US Patent and Trademark Office CSCL 14B

This high data rate pressure sensor module helps reduce energy consumption in wind tunnel facilities without loss of measurement accuracy. The sensor module allows for nearly a two order of magnitude increase in data rates over conventional electromechanically scanned pressure sampling techniques. The module consists of 16 solid state pressure sensor chips and signal multiplexing electronics integrally mounted to a four position pressure selector switch. One of the four positions of the pressure selector switch allows the in situ calibration of the 16 pressure sensors; the three other positions allow 48 channels (three sets of 16) pressure inputs to be measured by the sensors. The small size of the sensor module will allow mounting within many wind tunnel models, thus eliminating long tube lengths and their corresponding slow pressure response.
Official Gazette of the U.S. Patent and Trademark Office

N79-14348 National Aeronautics and Space Administration. Pasadena Office, Calif.
APPARATUS FOR PROVIDING A SERVO DRIVE SIGNAL IN A HIGH-SPEED STEPPING INTERFEROMETER **Patent**
Rudolf A. Schindler, inventor (to NASA) (JPL) Issued 2 Jan. 1979 12 p Filed 6 Jun. 1977 Supersedes N77-28395 (15 - 19, p 2525) Continuation of abandoned US Patent Appl. SN-565162, filed 4 Apr. 1975 Sponsored by NASA
(NASA-Case-NPO-13569-2; US-Patent-4,132,940;
US-Patent-Appl-SN-804035; US-Patent-Class-318-640;
US-Patent-Class-318-573; US-Patent-Class-318-594;
US-Patent-Appl-SN-565162) Avail: US Patent and Trademark Office CSCL 14B

An analog voltage approximately linearly proportional to a desired offset from the present null position of a moving mirror in an interferometer is applied to the mirror moving means. As

the mirror moves to the next null position, as determined by the analog voltage, the fringes of a laser reference interference pattern are detected. At the occurrence of each fringe the analog voltage is reduced proportionally so that when the next null position is reached, this driving analog is effectively zero. A binary up/down counter, by its internal count, causes a digital/analog converter to supply the analog voltage to the mirror moving means. Fringe detection and direction of movement logic cause the binary up/down counter to be decremented from its offset count as the mirror is moved to the new null position. Undesirable movement of the mirror due to vibration or other sources causes a correcting drive signal to be applied to the mirror moving means that is proportional to the distance of movement. Official Gazette of the U.S. Patent and Trademark Office

N79-14349* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VERSATILE LDV BURST SIMULATOR Patent
Otto Youngbluth, Jr., inventor (to NASA) Issued 19 Dec. 1979 7 p Filed 16 Dec. 1977 Supersedes N78-17367 (16 - 08, p 1022)
(NASA-Case-Lar-11859-1; US-Patent-4,130,795; US-Patent-Appl-SN-861396; US-Patent-Class-324-57R) Avail: US Patent and Trademark Office CSCL 14B

A device for generating burst signals is reported that can be used to determine whether or not a laser Doppler velocimeter is operating properly. A high frequency signal which corresponds to the information frequency of the laser Doppler velocimeter is modulated by a low frequency signal to provide an envelope for the high frequency signal. The high frequency signal is modulated by any modulator means such as, for example, an analog multiplier. The low frequency signal is added to the modulated signal to provide pedestals for the resulting series of burst pulses. The means are provided for selecting different combinations of these burst signals. Also means are provided for making the burst signals asymmetrical as desired. In addition, means are provided for varying the frequencies, and amplitudes of the information, envelope and pedestal frequency signals in the burst signals.
Official Gazette of the U.S. Patent and Trademark Office

N79-14350# Royal Aircraft Establishment, Farnborough (England).
OPTOMETER FOR THE RECORDING OF ACCOMMODATION MICROFLUCTUATIONS
Pierre Denieul and Jacques Simon Jul. 1978 21 p refs Transl. into ENGLISH from Vision Res. (France), v. 17. 1977 p 1115-1124
(RAE-Lib-Trans-1986; BR65488) Avail: NTIS HC A02/MF A01

An infrared optometer was developed for the dynamic recording of microfluctuations of the human eye accommodation. The measurement principle consists of optical quality analysis after double traverse of the eye (optical modulation factor). The apparatus enables measurements in natural conditions for the eye (pupil area covered and visual field sufficiently free to allow binocular vision of the fixation target). Ametropia of plus or minus 10D and astigmatism can be tested. With an artificial eye, the detectivity (for the bandwidth 0-4 Hz and a linear range of 1.5D) is 5/1000D with a 5 mm pupil diameter and 2/100D with a 3 mm pupil diameter. With the human eye, similar performances can be obtained and artifacts can be detected with another photometric path. Microfluctuations records are given for two different situations. Author

N79-14351*# Martin Marietta Corp., Baltimore, Md.
DEVELOPMENT OF IMPROVED LITHIUM TANTALATE PYROELECTRIC DETECTORS Final Report, 14 Sep. 1977 - 30 Sep. 1978
N. E. Byer, A. VanderJagt, and W. Holton Nov. 1978 67 p refs
(Contract NAS1-15108)
(NASA-CR-158982; TR-78-49) Avail: NTIS HC A04/MF A01 CSCL 14B

A program was undertaken to increase the detectivity of LiTaO3 pyroelectric detectors to meet a performance requirement of D star (500 K, 15 Hz) = 4x10 to the 9th power cm Hz1/2W-1. Emphasis was placed on reduction of the thermal conductance of the detector element to its surroundings, thinning the detector wafer to a thickness less than 3 micrometers, and increasing the absorptivity of the standard metallic film coatings. During the program, thermal conductance was reduced 41 percent through the use of reticulated (slotted) structures. Self-supported detector wafers less than 2 micrometers thick were fabricated. Multiple layer coatings, including an AR coating, with 16 percent more absorptance, were designed and fabricated. Later refinements in the multilayer design program have absorptivities of 75-80 percent, but detectors with these coatings had to be more than 2 micrometers thick because of a mismatch in the thermal expansion coefficients with LiTaO3. B.B.

N79-14352*# Morgan State Univ., Baltimore, Md.
THE CALIBRATION OF PHOTOGRAPHIC AND SPECTROSCOPIC FILMS: 1: A MICROSCOPIC ANALYSIS OF IIaO FILMS. 2: THE EFFECTS OF AGITATION AND SOAKING ON IIaO FILMS. 3: THE EFFECTS OF ELECTRIC FIELD ON IIaO FILMS. 4: THE EFFECTS OF X-RAY RADIATION ON IIaO FILMS
Ernest C. Hammond, Jr., Kevin Peters, and Kevin Boone Sep. 1978 57 p
(Grant NsG-5074)
(NASA-CR-158048) Avail: NTIS HC A04/MF A01 CSCL 14E

The grain structure of the emulsion using both reflected and transmission light was examined along with the effects of soaking. The effect of a static charge by a Tesla-coil, and the effects of airport equipment, and dental X-rays on the film were also analyzed. F.O.S.

N79-14353# Carson Alexiou Corp., Norwalk, Conn.
WIDEBAND DIGITAL DISK RECORDING TECHNIQUES PROGRAM Final Technical Report, Mar. 1977 - Mar. 1978
G. Wallmark Griffiss AFB, N. Y. RADC Aug. 1978 47 p
(Contract F30602-77-C-0086; AF Proj. 4027)
(AD-A059351; CF-01103078; RADC-TR-78-93) Avail: NTIS HC A03/MF A01 CSCL 09/2

A breadboard model Electron Beam Recorder on SiO2 storage targets was fabricated and evaluated under this program. The breadboard device in a drum configuration was used to make measurements of the frequency response of the electron gun and the electron beam in both read and write modes of operation. After completion of these measurements, the drum containing seven storage targets was installed and measurements of storage medium reciprocity and output signal to noise ratio (SNR) were made. Author (GRA)

N79-14354# Army Engineer Topographic Labs., Fort Belvoir, Va.
MATERIALS RESEARCH FOR HOLOGRAPHIC RECORDING. REPORT NUMBER 2: BLEACHING METHODS FOR PHOTOGRAPHICALLY RECORDED HOLOGRAMS
John W. Eastes Aug. 1978 24 p
(AD-A059548; ETL-0156) Avail: NTIS HC A02/MF A01 CSCL 14/5

This report describes tests and evaluations of chemical bleaches used to convert amplitude holograms to phase holograms. Diffraction efficiencies and noise characteristics of holograms prepared with six different bleaching procedures are reported. Formulations of the six different bleaches and procedures for their use are described. The report concludes that a reversal bleach used in combination with 649F plates gave the best combination of diffraction efficiency and signal-to-noise ratio. The report also concludes that bleached silver halide recording materials can be applied to areas where single images are involved, but that limited dynamic range will preclude their use as a medium for storing multiple continuous tone images.
Author (GRA)

N79-14355# Naval Research Lab., Orlando, Fla.
DYNAMICS AND RADIATIVE YIELDS FROM ALUMINUM MULTIPLE WIRE ARRAYS Interim Report
D. G. Colombant, M. Lampe, J. Davis, and H. W. Bloomberg Aug. 1978 54 p refs
(AD-A059883; NRL-MR-3840) Avail: NTIS HC A04/MF A01 CSCL 20/8

Numerical results are presented for the dynamics and radiative yields from aluminum multiple wire arrays. In order to reach

qualitative agreement with experimental results, it is found that the introduction of an enhanced anomalous resistivity is required. Physical origin of enhanced resistivity is briefly discussed. Author (GRA)

N79-14356# Technology, Inc., San Antonio, Tex. Life Sciences Div.

ENGINEERING TEST AND EVALUATION DURING HIGH G. VOLUME 1: DATA EVALUATION TECHNIQUES AND EQUIPMENT TESTS Final Report, 1 Feb. 1975 - 30 Sep. 1976

Roy W. Thompson, Gary L. Wilson, Paul E. Love, Larry J. Meeker, and Arnold G. Krueger Jun. 1978 73 p ref
(Contract F41609-75-C-0026)
(AD-A059352; SAM-TR-78-10-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 14/2

In the first volume of the three in this study report, the instrumentation, data recording, and computerized data analysis techniques for acceleration sensitivity studies are described in detail. The results of acceleration sensitivity tests on 7 test items are reported. These items are: a mass spectrometer, 4 physiologic pressure transducers, an ear oximeter, and a retrograde inflation anti-G suit. Author (GRA)

N79-14357# Oakland Univ., Rochester, Mich. School of Engineering.

SIMULTANEOUS DETERMINATION OF THREE STRAIN COMPONENTS IN SPECKLE INTERFEROMETRY USING A MULTIPLE IMAGE SHEARING CAMERA

Y. Y. Hung and A. J. Durelli Sep. 1978 48 p refs
(Contract N00014-76-C-0487; Grant NSF ENG-77-07974)
(AD-A059496) Avail: NTIS HC A03/MF A01 CSCL 20/6

This paper describes a multiple image-shearing camera. Incorporating coherent light illumination, the camera serves as a multiple shearing speckle interferometer which measures the derivatives of surface displacements with respect to three directions simultaneously. The application of the camera to the study of flexural strains in bent plates is shown, and the determination of the complete state of two-dimensional strains is also considered. The multiple image-shearing camera uses an interference phenomena, but is less demanding than holographic interferometry with respect to vibration isolation and the coherence of the light source. It is superior to other speckle techniques in that the obtained fringes are of much better quality. Author (GRA)

N79-14358# Defence Research Establishment, Ottawa. (Ontario). Nuclear Effects Section.

THE INTEGRATED SENSITIVITY OF HIGH-RANGE SOLID-STATE RADIACMETERS

C. Ross Hirning Jul. 1978 25 p refs
(AD-A058053; DREO-TN-78-9) Avail: NTIS HC A02/MF A01 CSCL 18/4

The precision of a radiacmeter is commonly indicated by specifying its response as a function of energy. In this note, a more useful and relevant quantity is defined: the integrated sensitivity is a measure of the average or overall response of a radiacmeter to a radiation field. The dependence of the sensitivity of a high-range solid-state-detector radiacmeter on variations in fall-out and fission-product gamma-ray energy spectra and on changes in the lower cutoff energy is investigated. Both measured and calculated detector response functions are considered. It is found that the detector sensitivity remains constant with changes in the gamma spectra due to age to within about + or - 6% in the worst case considered. These results are encouraging, and suggest that the development of a small-scale solid-state-detector radiacmeter should continue. In addition, a procedure for calibrating radiacmeters is given, and future necessary investigations are proposed. Author (GRA)

N79-14359# National Technical Information Service, Springfield, Va.

ELECTROLUMINESCENT DISPLAY DEVICES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Nov. 1978

George W. Reimherr Nov. 1978 170 p Supersedes NTIS/PS-1047; NTIS/PS-76/0900; NTIS/PS-75/742; NTIS/PS-75/035 (NTIS/PS-78/1170/6; NTIS/PS-77/1047; NTIS/PS-76/0900; NTIS/PS-75/742; NTIS/PS-75/035) Avail: NTIS HC $28.00/MF $28.00 CSCL 09E

Reports discussing the theory, design, applications, and materials studies related to electroluminescent displays are cited. Electroluminescent panels, electroluminescent diodes, light emitting diodes, and flat panel displays are included in the citations. A separate bibliography, titled Light Emitting Diodes, is available also. GRA

N79-14360# National Oceanic and Atmospheric Administration, Miami, Fla. Environmental Research Labs.

RESTORATION BY INVERSE FILTERING AND BY SYNTHESIS

Heinz H. Grote Jun. 1978 17 p refs
(PB-285996/5; NOAA-TM-ERL-RFC-1; NOAA-78080203)
Avail: NTIS HC A02/MF A01 CSCL 14B

The inverse filtering technique of restoration uses the presentation of the output-input relation in the complex frequency domain. It is restricted to linear systems. In contrast to the inverse filtering method, restoration by synthesis of a differential equation makes it possible to stay within the time domain for all operations. It is based on the description of the behavior of the measuring instrumentation by differential equations. Once these differential equations are established, the restoration procedure is straightforward. There is no restriction to linear systems. The main operation is the determination of the derivatives of the output function. Multiplied with the proper factors, they are combined according to the differential equation. This restoration technique is applicable to digital as well as analog computation. Special attention must be devoted to the execution of the differentiation. GRA

N79-14361# Swedish Council for Building Research, Stockholm.

ELECTROCHEMICAL ASPECTS OF ELECTRICAL RESISTANCE GAGES FOR CONCRETE

Jitendra Bhargava and Ake Rehnstrom 1978 33 p refs
(PB-285860/3; ISBN-91-540-2873-6; D11:1978) Avail: NTIS HC A03/MF A01 CSCL 14B

An orientation is given about the origin of double layer and a review of the various theoretical models of the double layer. The implications of the double layer for electrical resistance measurements are discussed. Tests were made to study this effect in case of electrical resistance humidity sensors used for moisture measurements in concrete. The influence of double layer was evaluated by a resistance-capacitance bridge. Some typical results of field and laboratory tests are given. Electrical capacitance sensors are not covered by the scope of this study. Results of some tests made to develop a gage for concrete, which has minimum interference from the double layer, are also included. GRA

N79-14262# Joint Publications Research Service, Arlington, Va.

THE POSSIBILITIES OF A LOGICAL CONTROL LAW FOR AN OPTOMECHANICAL SCANNER

V. G. Vyskub, S. V. Galuyev, V. B. Zadernyuk, B. S. Rozov, V. I. Savelyev, and P. I. Savostin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 31-36 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 21, no. 8, 1978 p 89-93
(For primary document see N79-14257 05-31)
Copyright. Avail: NTIS HC A04/MF A01

N79-14263# Joint Publications Research Service, Arlington, Va.

STATISTICAL ANALYSIS OF PHOTOELECTRIC MULTIPLIERS

K. N. Shchelkunov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 37-43 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 21, no. 8, 1978 p 94-99
(For primary document see N79-14257 05-31)
Copyright. Avail: NTIS HC A04/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N79-14362* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXTERNAL BULB VARIABLE VOLUME MASER Patent
Victor S. Reinhardt (Phoenix Corp., McLean, Va.) and Peter O. Cervenka, inventors (to NASA) (Phoenix Corp., McLean, Va.) Issued 5 Dec. 1978 10 p Filed 30 Nov. 1977 Supersedes N78-15474 (16 - 06, p 0763) Sponsored by NASA
(NASA-Case-GSC-12334-1; US-Patent-4,128,814; US-Patent-Appl-SN-856464; US-Patent-Class-331-94; US-Patent-Class-324-0.5) Avail: US Patent and Trademark Office CSCL 20E

A maser functioning as a frequency standard stable to one part in 10 to the 14th power includes a variable volume, constant surface area storage bulb having a fixed volume portion located in a resonant cavity from which the frequency standard is derived. A variable volume portion of the bulb, exterior to the resonant cavity, has a maximum volume on the same order of magnitude as the fixed volume bulb portion. The cavity has a length to radius ratio of at least 3:1 so that the operation is attained without the need for a feedback loop. A baffle plate, between the fixed and variable volume bulb portions, includes apertures for enabling hydrogen atoms to pass between the two bulb portions and is an electromagnetic shield that prevents coupling of the electromagnetic field of the cavity into the variable volume bulb portion.
Official Gazette of the U.S. Patent and Trademark Office

N79-14363# Army Missile Research and Development Command, Redstone Arsenal, Ala. Technology Lab.
DATA ACQUISITION FOR LASER GUIDANCE SYSTEM SIMULATION
William E. Webb 29 Jun. 1978 18 p refs
(AD-A059574; DRDMI-T-78-70) Avail: NTIS HC A02/MF A01 CSCL 17/7

In this report the capabilities and limitations of existing systems for measuring the beam profile of a laser designator is assessed. The assessment is made largely on the basis of information gathered by on-site inspection of operational systems at White Sands Missile Range, New Mexico and Hughes Aircraft Corporation, Culver City, California. Visits were also made to the Naval Postgraduate School, Monterey, California, Naval Weapons Center, China Lake, California, Southern Research Institute, Birmingham, Alabama and USAMIRADCOM, Redstone Arsenal, Alabama, in order to discuss laser spot mapping with personnel at these installations. In addition to evaluating the existing hardware, the requirements for future laser profile measurement systems were investigated. Estimates of the required dynamic range are given. Finally, some effort has been devoted to assessing the capability of existing propagation theory in predicting the statistics of the instantaneous beam cross-section. Author (GRA)

N79-14364# Naval Research Lab., Washington, D. C. Laser Physics Branch.
CGE ROD AMPLIFIER MODULES
John M. McMahon Aug. 1978 23 p refs Sponsored in part by DOE
(AD-A059856; NRL-MR-3848) Avail: NTIS HC A02/MF A01 CSCL 20/5

The performance and development history of the neodymium glass laser rod amplifiers in use at NRL on the Pharos II laser system is reviewed. The impact of possible future modifications is assessed. Author (GRA)

N79-14365# Texas Technological Univ., Lubbock. Optical Sciences Lab.
INTEGRAL EQUATIONS AND FUNCTIONAL METHODS FOR LASER MODE PROFILES Final Report
John D. Reichert and Ajit Kwatra 1 Dec. 1977 149 p refs (Grant AF-AFOSR-3278-77)
(AD-A059438; TTOSL-GRT-2; AFOSR-78-1234TR) Avail: NTIS HC A07/MF A01 CSCL 20/5

A new integral equation for optical resonators has been derived from the boundary value problem. This equation, called the Source Integral Equation (SIE), has been solved approximately and mode shapes compared with those from the widely used Fox-Li Integral Equation (FLIE). A double resonance condition (constraints on both mirror separation and transverse dimension) has been obtained from a self-consistency condition. Approximations to the resonance condition have been devised for the limiting case of flat mirrors. The results obtained from a Functional Equation Method (FEM) are compared with traditional computer solutions. The locations of the peaks and valleys agree well and the overall mode shapes are similar. This verifies the utility of the FEM for spherical mirrors of circular aperture. The FLIE and SIE results from the FEM, are compared to confirm the validity of the FEM approach for the SIE. The SIE results are compared to the traditional computer results to find effects of the corrections of the SIE to the FLIE. Author (GRA)

N79-14366# Chicago Univ., Ill.
MEASUREMENT OF FAST DESORPTION KINETICS OF D2 FROM TUNGSTEN BY LASER INDUCED THERMAL DESORPTION
James P. Cowin, Daniel J. Auerbach (Johns Hopkins Univ., Baltimore), Charles A. Becker, and Lennard Wharton Mar. 1978 26 p refs
(Contract N00014-77-C-0240)
(AD-A060113) Avail: NTIS HC A03/MF A01 CSCL 07/4

The laser desorption method has been shown analogous to the fast temperature jump method used for studying reactions in condensed phases, and is capable of sorting out elementary processes that have differing activation energies. The variation of total flux desorbed vs. maximum temperature reached and vs. initial surface coverage determined, gave with the aid of a model kinetic rate expression desorption rate parameters. It was shown that at rates 100,000 times faster than previous measurements the kinetics of desorption of hydrogen follows the same reaction equations. Since the desorption time is short compared to the range of desorbate flight times to the mass spectrometer detector, velocity distributions of the desorbing species were determined. This along with the surface temperature history gave additional information on the reaction rate model. In the present experiments a significant number of desorbate-desorbate collisions could occur. Corrections were made for the collisional effects in the interpretation of the data. In addition it was shown how modifications of the technique could be used to mitigate the effects of collisions. Author (GRA)

N79-14367# Pasadena Foundation for Medical Research, Calif.
THE EFFECT OF LASER ENERGY ON CELLS IN TISSUE CULTURE Final Report, 1963 - 1976
Donald E. Rounds May 1978 32 p refs
(Contract DA-49-193-MD-2564)
(AD-A060299; FR-6) Avail: NTIS HC A03/MF A01 CSCL 06/18

The first area reported that energy-dependent biological systems, such as mitosis and contractile activity of heart, skeletal muscle and smooth muscle tissues, showed a temporary (and sometimes permanent) reduction in activity when irradiated with a ruby laser. Evidence for another indirect form of biological damage stemmed from the observation that ruby laser irradiation of cells in tissue culture depleted the population of intact lysosomes and released a mixture of amino acids, nucleosides and nucleotides. Studies utilizing a variety of laser wavelengths illustrated the requirement for absorbing laser energy in natural or artificial chromophores before biological effects could be produced. Pigmented cells were damaged by ruby laser treatment in proportion to the number of melanin granules per cell. GRA

N79-14368# Missouri Univ. -St. Louis.
POTENTIAL LASER ACTION IN He-METAL VAPOR MIXTURES
Jacob J. Leventhal 27 Sep. 1978 3 p
(Contract N00014-76-C-0760)
(AD-A059959) Avail: NTIS HC A02/MF A01 CSCL 20/5

Cross sections for excited state production in ion-molecule collisions have been measured by observing radiation resulting from decay of the excited species. Recent work involving collisions of He(-) or He2(-) with Mg and Zn are discussed. Author (GRA)

N79-14369# Watervliet Arsenal, N.Y.
LASER SCAN INSPECTION SYSTEM Final Report, Mar. 1976 - Mar. 1978
S. J. Krupski and F. J. Audino Jun. 1978 28 p refs
(AD-A059852; WVT-QA-7801) Avail: NTIS HC A03/MF A01 CSCL 20/5

The present magnetic particle method of inspection using a black light borescope for the detection of cannon bore indications such as cracks, inclusions and discontinuities is time consuming and requires constant operator control. The inspector is highly susceptible to fatigue from prolonged staring into the scope which increases the possibility of overlooking a defect. A new method employing a recently developed laser scan inspection system automatically scans, detects and records indications. In doing so, it provides a faster and more reliable inspection method to replace the method using a black light borescope. Author (GRA)

N79-14370# TRW Defense and Space Systems Group, Redondo Beach, Calif.
ADVANCED LASER CONCEPTS Final Report
Kirtland AFB, N. Mex. AFWL May 1978 117 p refs
(Contract F29601-76-C-0065; AF Proj. 1256)
(AD-A059811; AD-E200167; AFWL-TR-77-234) Avail: NTIS HC A06/MF A01 CSCL 20/5

Studies directed toward the development of a chemically pumped electronic transition laser are described. A small-scale HF/DF laser device was used to study excited state production in hydrogen-fluorine reactive flows. The number densities of the A doublet pi and x doublet sigma states of CN in hydrogen-fluorine cyanogen compound flames were measured. It was concluded that a population inversion between these two states was not achieved even though extremely high densities of the A doublet pi state of CN were formed. The pure chemical production of the b singlet sigma plus and a singlet delta states of NF was also demonstrated. For these studies, fluorine atoms formed in the precombustor of the laser were mixed with hydrogen to produce hydrogen atoms. These hydrogen atoms then reacted with NF2 radicals produced by the heating of N2F4 to produce the NF excited states. The densities measured were too low for laser production. However, the system may be scalable to laser proportions. Author (GRA)

N79-14371# Laser Analytics, Inc., Lexington, Mass.
TUNABLE DIODE LASER MEASUREMENT OF H2O AND CO2 LINE PARAMETERS IN THE 10-15 MICROMETERS SPECTRAL REGION Scientific Report, Dec. 1976 - 31 Mar. 1978
R. S. Eng and A. W. Mantz 20 Jun. 1978 64 p refs
(Contract F19628-77-C-0015)
(AD-A059402; AFGL-TR-78-0178; SR-1) Avail: NTIS HC A04/MF A01 CSCL 07/2

This is an experimental research program to investigate the spectral characteristics of water vapor in selected regions of the spectrum using a tunable diode laser system. A primary goal of the program is to obtain information that will provide a basis for understanding and predicting the properties of the atmospheric water vapor absorption continuum. The main tasks of the program are to: (1) characterize the spectral absorption of H2O vapor throughout the 980-1080/cm range under ultrahigh resolution and with variation of temperature, pressure and nature of the mixing gas, and (2) perform far-wing absorption measurements on selected H2O absorption lines as the lines are modulation pumped at line centers. GRA

N79-14372# Pennsylvania State Univ., University Park. Applied Research Lab.
REFLECTIVITY CHANGES OF GERMANIUM DUE TO INTENSE RADIATIONS OF UNEQUAL FREQUENCIES M.S. Thesis
Arthur H. Carrieri 9 Aug. 1978 62 p refs
(Contract N00017-73-C-1418)
(AD-A059427; ARL/PSU/TM-78-212) Avail: NTIS HC A04/MF A01 CSCL 07/2

Changes in the reflectivity of germanium as a function of irradiation light intensity up to 6 Ms/sq cm were used as a method of studying temporary diffraction gratings. This method utilizes an intense, or pumping, laser beam and a weak, or probing, laser beam both of which were produced from the same ruby source. They were used at small angles of incidence and were coincident at the sample's surface. The frequency of the probing beam was made slightly different from that of the pumping beam by one of two nonlinear backscattering processes, stimulated Brillouin scattering (SBS), or stimulated thermal Rayleigh scattering (STRS). When the planes of polarization of the two beams are parallel, the effects of interference will cause a spatial and temporal variation in the optical properties of the germanium surface producing a surface wave. GRA

N79-14373# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
STUDY OF INFRARED AND VISIBLE GAS LASERS Final Report, 1 Oct. 1974 - 30 Sep. 1977
Ali Javan Griffiss AFB RADC Mar. 1978 148 p refs
(Contract F19628-75-C-0060; AF Proj. 5634)
(AD-A059429; RADC-TR-78-62) Avail: NTIS HC A07/MF A01 CSCL 20/5

Several topics are summarized in the areas of laser studies of velocity-dependent collision cross sections continuously-tunable high-pressure CO2 lasers, multifrequency CO2 lasers, vibrational energy transfer in summetric top molecules, visible laser-induced chemical reactions, coherent pulse propagation and population inversion using adiabatic rapid passage, high-pressure CO2 capillary lasers, study of molecular helium, a stacked Blumlein N2 laser, excimer lasers, water vapor spectroscopy using a tunable SFR laser, two photon spectroscopy in NO, anomalous Zeeman in CO2 and N2O, and hyperfine structure in N2O. Author (GRA)

N79-14374# Arizona Univ., Tucson.
A FEASIBILITY STUDY ON THE USE OF LIDAR IN THE DETERMINATION OF OPTICAL PROPERTIES UNDER BATTLEFIELD CONDITIONS Final Report
B. M. Herman, J. A. Reagan, and R. M. Schotland Jul. 1978 72 p refs
(Contract DAAG29-76-D-0100)
(AD-A059317; ERADCOM/ASL-CR-78-0100-1) Avail: NTIS HC A04/MF A01 CSCL 17/5

A feasibility study on the use of lidar in the determination of optical properties under battlefield conditions was undertaken. The study was divided into two main topics, i.e., (1) design an experiment to characterize the optical properties of particulates typical of those encountered under battlefield conditions, (2) determine the parameters of the lidar or lidars and auxiliary equipment necessary to determine the particulate optical characteristics. It is concluded that if a single wavelength system is to be employed, the 10.6 micrometers CO2 system is the most promising. Author (GRA)

N79-14375# Colorado Univ., Boulder.
OPTICAL AND DISCHARGE STUDIES OF NOVEL ELECTRONIC TRANSITION LASER SPECIES Interim Report
Stephen R. Leone 1 Jun. 1978 33 p refs
(Contract N00014-77-C-0115; ARPA Order 2840)
(AD-A059979) Avail: NTIS HC A03/MF A01 CSCL 20/5

A program has been developed to use spectroscopic insight and laboratory experiments to identify potentially important new laser candidates. An innovative series of visible and ultraviolet lasers on high temperature diatomic molecules has been discovered. To date both S2 and Te2 have been demonstrated to lase by optical pumping. Because of unique features of the diatomic molecular states, these molecules have potential to make highly efficient laser devices for DoD applications. A series of wavelength tunable photolysis experiments have been carried out on the gas phase molecule HgI2. In these experiments the quantum yield of excited I(2P1/2) atoms is determined to be unity at the peak of the first long wavelength absorption band. HgI2 might make an interesting new source of I^* for the 1.315 micrometers I^* laser, since the photolysis products rapidly recombine in a completely reversible way to produce the parent molecule. GRA

N79-14376# Los Alamos Scientific Lab., N. Mex.
EXPLORATORY LASER-DRIVEN SHOCK WAVE STUDIES
J. C. Solem and L. R. Veeser Nov. 1977 11 p refs Sponsored by DOE
(LA-6997-MS) Avail: NTIS HC A02/MF A01

The results of a feasibility study for investigating shock

structure and for measuring equation of state parameters using high energy, short pulse lasers are shown. The temporal and spatial structure of the luminosity from laser driven shock unloading in aluminum foils are discussed. It is demonstrated that shock velocity can be measured by observing the time interval between shock emergence across two thicknesses. The fact that shock fronts are observed cleanly breaking through steps as small as 3 microns indicates that the shock front thickness is very small in the few megabar region; this is the first experimental verification that these fronts are not more than a few micrometers thick. Approximate measurements of free-surface velocity are presented. The use of these techniques to obtain detailed equation-of-state data is considered. DOE

N79-14377# California Univ., Livermore. Lawrence Livermore Lab.
PULSED POWER SUPPLIED FOR LARGE LASER SYSTEMS
B. Carder, W. Gagnon, and K. Freytag 9 Nov. 1977 11 p refs Presented at Seminar on Energy Storage, Compression, and Switching, Canberra, Australia, 15-21 Nov. 1977
(Contract W-7405-eng-48)
(UCRL-80113) Avail: NTIS HC A02/MF A01

Pulsed power requirements of large glass laser systems are discussed. A brief assessment is given of the technology surrounding fusion breakeven point for laser systems and future technological needs are outlined. L.S.

N79-14378# National Technical Information Service, Springfield, Va.
LASER FUSION, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1977
David W. Grooms Oct. 1978 253 p 2 Vol.
(NTIS/PS-78/1061/7) Avail: NTIS HC $28.00/MF $28.00 CSCL 18A

The bibliography cites research on target fabrication, laser implosion instability, and laser produced plasma studies. Soviet developments in laser fusion are included. This updated bibliography contains 247 abstracts, none of which is new to the previous edition. GRA

N79-14379# National Technical Information Service, Springfield, Va.
LASER FUSION, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Oct. 1977 - Aug. 1978
George W. Reimherr Oct. 1977 123 p Supersedes NTIS/PS-77/0865; NTIS/PS-76/0856; NTIS/PS-75/783 2 Vol.
(NTIS/PS-78/1062/5; NTIS/PS-77/0865; NTIS/PS-76/0856; NTIS/PS-75/783) Avail: NTIS HC $28.00/MF $28.00 CSCL 18A

This bibliography cites 118 research reports on laser produced plasmas, plasma instabilities, and the fabrication of laser targets. Mathematical modeling and computer programming are included. All entries in this updated bibliography are new to the previous edition. GRA

N79-14380# National Technical Information Service, Springfield, Va.
ACOUSTOOPTICAL LASER MODULATORS AND DEFLECTORS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1969 - Nov. 1978
Mona F. Smith Nov. 1978 105 p Supersedes NTIS/PS-77/1071 2 Vol.
(NTIS/PS-78/1186/2; NTIS/PS-77/1071) Avail: NTIS HC $28.00/MF $28.00 CSCL 20F

Citations of Federally-funded research on acoustooptic equipment in laser beam modulation, filtering, scanning, deflection, switching, and tuning are covered. The uses of these acoustooptical devices in imaging, fiber optics, optical communications, optical radar, and measuring instruments are described. Research on carbon dioxide and dye lasers is included. This updated bibliography contains 98 abstracts, 8 of which are new entries to the previous edition. GRA

N79-14381# National Technical Information Service, Springfield, Va.
ACOUSTOOPTICAL LASER MODULATORS AND DEFLECTORS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1978
Mona F. Smith Nov. 1978 100 p Supersedes NTIS/PS-77/1072 2 Vol.
(NTIS/PS-78/1187/0; NTIS/PS-77/1072) Avail: NTIS HC $28.00/MF $28.00 CSCL 20F

Abstracts of worldwide research on the theory and design of acoustooptical devices for laser beam modulation, deflection, splitting, mode locking, and tuning are presented. Studies on materials and their performance are covered. The applications of the acoustooptic interaction for the development of devices for optical information processing, optical modulators, switches, scanners, and color TV display systems are included. Simulation, testing, and performance of the equipment are also described. This updated bibliography contains 95 abstracts, 18 of which are new entries to the previous edition. GRA

N79-14867# Joint Publications Research Service, Arlington, Va.
A UNIVERSAL METHOD FOR THE CONVERSION OF LASER FIELDS WITH COMPLEX TRANSVERSE MODE STRUCTURES
A. V. Gnatovskiy, A. P. Loginov, M. V. Nikolayev, and M. T. Shpak *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 57 (JPRS-72547) 2 Jan. 1979 p 7-15 refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 23, no. 2, 1978 p 311-317 (For primary document see N79-14866 05-70)
Copyright. Avail: NTIS HC A03/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N79-14382* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LOCKING REDUNDANT LINK Patent
Frank Henry Bonisch, inventor (to NASA) (Sikorsky Aircraft, Stratford, Conn.) Issued 5 Sep. 1978 6 p Filed 7 Mar. 1977 Supersedes N77-18134 (15 - 09, p 1130) Sponsored by NASA
(NASA-Case-LAR-11900-1; US-Patent-4,111,068; US-Patent-Appl-SN-775239; US-Patent-Class-74-586; US-Patent-Class-403-105; US-Patent-Class-416-61) Avail: US Patent and Trademark Office CSCL 13I

A low-friction, axially extensible strut, automatically lockable in both tension and compression, for use as a secondary load path in helicopter main rotor force measurement systems is described. Official Gazette of the U.S. Patent and Trademark Office

N79-14383* National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH-TORQUE OPEN-END WRENCH Patent
Anthony Giandomenico (JPL), James M. Dame (JPL), and Harold Behimer, inventors (to NASA) (JPL) Issued 19 Dec. 1978 5 p Filed 29 Aug. 1977 Supersedes N78-22375 (16 - 13, p 1705) Sponsored by NASA
(NASA-Case-NPO-13541-1; US-Patent-4,130,032; US-Patent-Appl-SN-828262; US-Patent-Class-81-119; US-Patent-Class-81-90B; US-Patent-Class-81-180B) Avail: US Patent and Trademark Office CSCL 13I

A wrench is described that is usable where limited access normally requires an open-end wrench, but which has substantially the high-torque capacity and small radial clearance characteristics of a closed-end wrench. The wrench includes a sleeve forming a nut-engageable socket with a gap in its side, and an adaptor forming a socket with a gap in its side, the adaptor closely surrounding the sleeve and extending across the gap in the sleeve. The sleeve and adaptor have surfaces that become fully engaged when a wrench handle is applied to the adaptor to turn it so as to tighten a nut engaged by the sleeve.
Official Gazette of the U.S. Patent and Trademark Office

N79-14384 Engineering Sciences Data Unit, London (England).
THE EFFECT OF POST-WELD TREATMENTS ON FATIGUE AT FILLET WELDED ATTACHMENTS

May 1978 15 p
(ESDU-78016; ISBN-0-85679-217-9) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161

Information is given on the effect of post-weld treatments on the as-welded fatigue strength of non load carrying longitudinal and transverse fillet welded attachments to steel plates subjected to axial fatigue loading. The attachments covered by this item are transverse fillet welded attachments, longitudinal stiffener and flange type attachments and wing butt welds. ESDU

N79-14385*# Battelle Columbus Labs., Ohio.
DETERMINATION OF LUBRICANT SELECTION BASED ON ELASTOHYDRODYNAMIC FILM THICKNESS AND TRACTION MEASUREMENT Final Report
T. A. Dow and J. W. Kannel Jan. 1979 113 p refs Sponsored in part by Army Aviation Research and Development Command, St. Louis
(NASA-CR-159428) Avail: NTIS HC A06/MF A01 CSCL 11H

The project was conducted to aid in the development of an elastohydrodynamic specification for military lubricants. Experiments were conducted with a rolling disk apparatus designed to simulate a bearing or gear type contact. Measurements included lubricant film thickness, lubricant breakdown and traction for a range of loads, speeds, temperatures, and surface roughnesses. Several lubricants were used in the investigations including a traction fluid, two synthetic paraffinic lubricants and several lubricants conforming to MIL-L 7808 and 23699 specifications. Recommendations regarding an EHD specification are included. Author

N79-14386*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND TRANSFER OF COPPER, SILVER, AND GOLD TO IRON IN THE PRESENCE OF VARIOUS ADSORBED SURFACE FILMS
Donald H. Buckley Jan. 1979 19 p refs
(NASA-TP-1392; E-9684) Avail: NTIS HC A02/MF A01 CSCL 20K

Sliding friction experiments were conducted with the noble metals copper, silver, and gold and two binary alloys of these metals contacting iron in the presence of various adsorbates including, oxygen, methyl mercaptan, and methyl chloride. A pin on disk specimen configuration was used with a load of 100 grams, sliding velocity of 60 mm/min; at 25 C with the surfaces saturated with the adsorbates. Auger emission spectroscopy was used to monitor surface films. Results of the experiments indicate that friction and transfer characteristics are highly specific with respect to both the noble metal and surface film present. With all three metals and films transfer of the noble metal to iron occurred very rapidly. With all metals and films transfer of the noble metal to iron continuously increased with repeated passes except for silver and copper sliding on iron sulfide. Author

N79-14387*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR CHARACTERISTICS OF IRON-CHROMIUM ALLOYS IN CONTACT WITH THEMSELVES AND SILICON CARBIDE
Kazuhisa Miyoshi and Donald H. Buckley Jan. 1979 23 p refs
(NASA-TP-1387; E-9670) Avail: NTIS HC A02/MF A01 CSCL 20K

Sliding friction experiments were conducted with various iron-chromium alloys in contact with (1) themselves, (2) single crystal silicon carbide disks, and (3) single crystal abrasive grit of silicon carbide. Results indicate the coefficients of friction for the alloys sliding against themselves are between those for pure iron and pure chromium, and are only slightly different with 1, 5, 9, 14, and 19 weight percent chromium in iron. The wear is due, primarily, to shearing, or tearing fracture, of the cohesive bonds in the bulk metal and plowing of the bulk by lumps of wear debris. There are only slight differences in the coefficients of friction for the various alloys when sliding on silicon carbide. The coefficient of friction for the alloys are higher than those for pure iron and pure chromium. Alloy hardening observed in the alloys plays a dominant role in controlling the abrasive friction and wear behavior of the alloys. Author

N79-14388*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FLUIDIZED BED COAL COMBUSTION REACTOR Patent Application
Philip I. Moynihan (JPL) and Donald L. Young, inventors (to NASA) (JPL) Filed 15 Dec. 1978 13 p
(Contract NAS7-100)
(NASA-Case-NPO-14273-1; US-Patent-Appl-SN-969759) Avail: NTIS HC A02/MF A01 CSCL 13H

A fluidized bed coal reactor which includes a combination nozzle-injector ash-removal unit formed by a grid of closely spaced open channels, each containing a worm screw conveyor, which function as continuous ash removal troughs is presented. A pressurized air-coal mixture is introduced below the unit and is injected through the elongated nozzles formed by the spaces between the channels. The ash build-up in the troughs protects the worm screw conveyors as does the cooling action of the injected mixture. The ash layer and the pressure from the injectors support a fluidized flame holder combustion zone above the grid which heats water in boiler tubes disposed within and/or above the combustion zone and/or within the walls of the reactor. NASA

N79-14389*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF CBS 600 CARBURIZED STEEL AS A GEAR MATERIAL
Dennis P. Townsend, Richard J. Parker, and Erwin V. Zaretsky Jan. 1979 27 p refs
(NASA-TP-1390; E-9651) Avail: NTIS HC A03/MF A01 CSCL 13I

Gear endurance tests were conducted with one lot of consumable-electrode vacuum-melted (CVM) AISI 9310 gears and one lot of air-melt CBS 600 gears. The gears were 8 pitch with a pitch diameter of 8.89 centimeters (3.5 in.). Bench-type rolling-element fatigue tests were also conducted with one lot of CVM AISI 9310, three lots of CVM CBS 600, and one of air-melt CBS 600 material. The rolling-element bars were 0.952 centimeter (0.375 in.) in diameter. The CBS 600 material exhibited pitting fatigue lives in both rolling-element specimens and gears at least equivalent to that of CVM AISI 9310. Tooth fracture failure occurred with the CBS 600 gears after overrunning a fatigue spall, but it did not occur with the CVM AISI 9310 gears. Tooth fracture in the CBS 600 was attributed to excessive carbon content in the case, excessive case depth, and a higher than normal core hardness. Author

N79-14390# Naval Ship Research and Development Center, Bethesda, Md.
THEORETICAL ANALYSIS OF SWING-PAD BEARINGS WITH SMALL IMPERFECTIONS Interim Report, Jan. 1976 - Dec. 1977
Charles W. Dawson and Paul Morawski Aug. 1978 32 p refs
(ZF6152001)
(AD-A059342; DTNSRDC-78/069) Avail: NTIS HC A03/MF A01 CSCL 13/9

A theoretical study was made of swing-pad bearings with small imperfections. The main conclusions are: (1) bearing performance will depend greatly on the imperfections in the bearings; swing-pad bearings may have to be manufactured to very small tolerances to be reliable; (2) swing-pad bearings are not significantly better than tilt-pad bearings under moderate load conditions; and (3) under severe conditions in which the bearing pads frequently contact the moving surface, the swing-pad bearing will perform better than a tilt-pad bearing. Agreement between theory and experiment is only qualitative at best, so these conclusions cannot be considered final. Author (GRA)

N79-14391# Massachusetts Inst. of Tech., Cambridge. Lab. for Manufacturing and Productivity.
EFFECT OF ABRASIVE GRIT SIZE ON ABRASIVE WEAR Progress Report, 1 Jan. - 31 Dec. 1977
Nam P. Suh, Nannaji Saka, and Hyo-Chol Sin Jun. 1978 130 p refs

(Contract N00014-76-C-0068)
(AD-A060120) Avail: NTIS HC A07/MF A01 CSCL 11/11

The purpose of the M.I.T. research on wear during the calendar year 1977 was to apply the delamination theory of wear in minimizing the wear rate of splines and door hinges. The technique explored was the use of thin soft metal coatings on hard substrates, which was shown in a prior study to increase the wear resistance by three orders of magnitude. One of the problems concerning the use of thin metal coatings in these applications was the possible removal of the coated material by oxides on splines and salts formed on door hinges. Therefore, two-pronged investigations were undertaken in collaboration with NADC and Foxboro/Trans-Sonics, Inc: the realistic evaluation of soft metal coatings and the role of abrasive wear in these applications. This report describes the work done on the basic abrasive wear mechanisms, in particular the size effect of abrasive particles on abrasive wear. GRA

N79-14392# Chicago Univ., Ill. James Franck Inst.
UHV APPLICATION OF SPRING LOADED TEFLON SEALS
Daniel J. Auerbach (Johns Hopkins Univ., Baltimore, Md.), Charles A. Becker, James P. Cowin, and Lennard Wharton Jul. 1978 6 p refs
(Contract N00014-75-C-1107; Grant AF-AFOSR-3186-77)
(AD-A060112) Avail: NTIS HC A02/MF A01 CSCL 11/1

Large, bakeable, rotatable ultra high vacuum seals capable of operation at ten to the minus 11th power torr are described. They employ doubly differentially pumped commercially available spring loaded Teflon seals. A static version is very convenient for quick access as it requires nearly negligible sealing force other than atmospheric force. Author (GRA)

N79-14393# Oak Ridge National Lab., Tenn.
HALF-BEAD (TEMPER) REPAIR WELDING FOR HEAVY-SECTION STEEL TECHNOLOGY PROGRAM VESSELS
S. W. Wismer and P. P. Holz Jun. 1978 129 p refs
(Contract W-7405-eng-26)
(NUREG-CR-0113; ORNL-NUREG-TM-177) Avail: NTIS HC A07/MF A01

The half-bead (temper) welding technique performed to Section 11 of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code guidelines was used successfully on cavities placed in three thick-walled pressure vessel models to simulate repair welding of operational nuclear reactor vessels. One of the models served as a qualification-procedure test specimen, as required by the Code, and was subsequently utilized for detailed metallurgical examinations. After welding, a low-temperature temper treatment, or postweld heat treatment (PHWT), was performed for 4 hrs. Final nondestructive repair inspections were made a minimum of 48 hrs. after the vessels had cooled to ambient temperature. Magnetic-particle surface inspections and ultrasonic inspections of the repairs revealed no indication of any delayed cracking. A second ultrasonic inspection of one of the vessel repairs by ORNL approximately 12 weeks after postrepair welding also revealed no indications of delayed cracking. Final ultrasonic and radiographic test results were acceptable for all repair welds. DOE

N79-14394# Laboratoire Suisse de Recherches Horlogeres, Neuchatel (Switzerland).
WEAR OF MODIFIED ELECTRICAL BRUSH MATERIAL IN VACUUM
M. Maillat, H. R. Kocher, and H. E. Hintermann Paris ESA Apr. 1978 45 p In FRENCH Prepared for Natl. Centre of Tribology Sponsored by ESA
(ESA-ESTL-33; ESA-CR(P)-1080; Rept-980-2.1) Avail: NTIS HC A03/MF A01

Ultra high vacuum friction tests on brushes were made in the absence of electric current. The composition of the brush material, 84 weight percent Ag, 15 percent MoS2 and 1 percent Cu, had been modified with respect to previous tests in order to obtain better homogeneity. The test pieces were kept in one direction with respect to the structural orientation of the material. It appeared that the wear was higher than for the brushes used initially and that the wear varied strongly from one test piece to the other. ESA

N79-14395# National Technical Information Service, Springfield, Va.
ROLLER BEARINGS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Sep. 1978
Guy E. Habercom, Jr. Oct. 1978 218 p Supersedes NTIS/PS-77/0987; NTIS/PS-76/0887
(NTIS/PS-78/1111/0; NTIS/PS-77/0987; NTIS/PS-76/0887) Avail: NTIS HC $28.00/MF $28.00 CSCL 13I

A bibliography containing 214 abstracts concerning the design and performance of roller bearings is presented. Rolling contact bearing surfaces, hardening methods, mechanical properties, and lubricating techniques are among the areas reviewed. GRA

N79-14396# Environmental Protection Agency, Ann Arbor, Mich. Technology Assessment and Evaluation Branch.
EMISSIONS AND FUEL ECONOMY TESTING OF A NAVAL ACADEMY HEAT BALANCED ENGINE (NAHBE)
Apr. 1978 28 p
(PB-285382/8; Rept-78-1-AB) Avail: NTIS HC A03/MF A01 CSCL 21G

Various efforts of Naval Academy researchers were directed toward improving the combustion cycle of spark ignition engines. During the past several years a technique was developed which is based on pressure exchange between two zones in the combustion chamber thereby achieving a heat balanced cycle (NAHBE) which supposedly combines the best characteristics of the DIESEL and Otto cycles. In 1977 EPA was requested to test an engine modified to the NAHBE configuration. Due to the required break-in of new engines, the testing was done in early 1978. The tests involved characterizing the fuel economy and emission of the test engines under operating conditions. GRA

N79-14397# Environmental Protection Agency, Ann Arbor, Mich. Technology Assessment and Evaluation Branch.
INVESTIGATION OF TURBO-DYNE ENERGY CHAMBER (G:R: VALUE TRADEMARK): AN AIR BLEED DEVICE
F. Peter Hutchins and James M. Kranig Apr. 1978 22 p
(PB-285381/0; Rept-78-2-FPH) Avail: NTIS HC A02/MF A01 CSCL 13F

An air bleed device, known as G'R' Valves (trademark) was tested. The test was done at the request of the Federal Trade Commission. Advertisements for the device claimed that it would lower exhaust contaminants, improve fuel economy, etc. The test was done to evaluate actual results with advertisement claims. The test results are presented in tabular form. GRA

N79-14258# Joint Publications Research Service, Arlington, Va.
MACHINE TOOL DIGITAL CONTROL PROGRAM PREPARATION AT MINSK CENTER
M. Zhadovich *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 1-5 Transl. into ENGLISH from Prom. Belorussii (Minsk), no. 8, 1978 p 60-62 (For primary document see N79-14257 05-31)
Copyright. Avail: NTIS HC A04/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N79-14398* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LENGTH MODE PIEZOELECTRIC ULTRASONIC TRANSDUCER FOR INSPECTION OF SOLID OBJECTS Patent
Robert B. Thompson, inventor (to NASA) (Rockwell Intern. Corp., Los Angeles) Issued 31 Oct. 1978 7 p Field 16 Jun. 1976 Sponsored by NASA
(NASA-Case-MSC-19672-1; US-Patent-4,122,725; US-Patent-Appl-SN-696679; US-Patent-Class-73-632; US-Patent-Class-73-641; US-Patent-Class-73-644; US-Patent-Class-310-326; US-Patent-Class-310-336) Avail: US

Patent and Trademark Office CSCL 14D

The transducer is constructed from individual transducer elements arranged in an array and configured to exhibit a predominant, longitudinal mode transversely to the array. The elements are interconnected through thin flexible sheets. Each element is individually damped, and the transducer as a whole is electrically damped through resonance with the clamped capacitance and dissipation. Electrical control permits inphase operation of all transducer elements or control with preselected phase differences. Official Gazette of the U.S. Patent and Trademark Office

N79-14399# Southwest Research Inst., San Antonio, Tex.
NONDESTRUCTIVE TESTING INFORMATION ANALYSIS CENTER, 1977 Annual Technical Report, 15 Feb. 1977 - 15 Feb. 1978
1978 41 p refs
(Contract DLA900-77-C-3733)
(AD-A060345; SWRI-15-4823) Avail: NTIS HC A03/MF A01 CSCL 05/2

The technical scope of NTIAC is that of the entire field of nondestructive testing, inspection, and evaluation--the full range of methods and techniques whereby a material, component or entire system can be so characterized as to reliably predict its performance under a prescribed service regime. The major areas of NTIAC's activity are: the information support system; current awareness and promotion activities; technical and bibliographic inquiries; technical publications; and special services. GRA

N79-14400# Reliability Analysis Center, Griffiss AFB, N. Y.
NONELECTRONIC PARTS RELIABILITY DATA
Donald W. Fulton (IIT Research Inst., Chicago) 1978 243 p
(Contract F30602-77-C-0167)
(AD-A059901; RAC-NPRD-1) Avail: NTIS HC A11/MF A01 CSCL 14/4

This report, organized in four major sections, presents reliability information for more than 250 major nonelectronic part types based on test, field operation and dormant state conditions. The four major sections are Generic Data, Detailed Data, Application Data, and Failure Modes and Mechanisms. Author (GRA)

N79-14401# Battelle Columbus Labs., Ohio.
FEASIBILITY EVALUATION OF ADVANCED EDDY CURRENT INSPECTION EQUIPMENT FOR USE IN NAVAL AVIATION MAINTENANCE ENVIRONMENT Final Report, 18 Jul. 1977 - 16 Feb. 1978
Robert P. Meister and Stephen D. Brown Lakehurst, N. J. Naval Air Eng. Center 28 Sep. 1978 38 p ref
(Contract N68335-77-C-1116)
(AD-A060076; NAEC-92-128) Avail: NTIS HC A03/MF A01 CSCL 15/5

This report presents Phase I of a three phase program to develop a general eddy current system incorporating advanced eddy current signal processing. Phase I describes feasibility and applications for general system requirements such as (1) capability to cover broad spectrum of materials and (2) incorporation of advanced eddy current concepts in a system operable by relatively unskilled operators. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N79-14402 Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 10, NO. 1
Jan. 1978 101 p refs
(AD-A049140/7) Avail: SVIC, Code 8404, Naval Research Lab., Washington, D. C. 20375 CSCL 20K

Current literature in the field of shock and vibration technology is reviewed. Topics covered include scale modeling and parametric vibration. For individual titles, see N79-14403 through N79-14404.

N79-14403 Iowa State Univ. of Science and Technology, Ames.
SCALING AND MODELING FOR EXPERIMENT
G. Murphy *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 10, No. 1 Jan. 1978 p 5-13 refs (For primary document see N79-14402 05-39)
Avail: SVIC, Code 8404, Naval Research Lab, Washington, D. C. 20375 CSCL 20K

The design of scale models which consider shock and vibration phenomenon is considered. Topics covered include fluid dynamics; vibration and flutter; acoustics; structural impact; explosions; and seismic response. J.M.S.

N79-14404 Dundee Univ. (Scotland).
PARAMETRIC VIBRATION. PART 1: MECHANICS OF LINEAR PROBLEMS
R. A. Ibrahim (Arab Organization for Industrialization) and A. D. S. Barr *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 10, No. 1 Jan. 1978 p 15-29 refs (For primary document see N79-14402 05-39)
Avail: SVIC, Code 8404, Naval Research Lab., Washington, D. C. 20375 CSCL 20K

The theory of parametric vibration and its related current problems are surveyed with emphasis on linear systems. It is concluded that: (1) the mechanics of vibrating systems subjected to a prescribed parametric excitation can be described mathematically by a set of linear differential equations whose coefficients vary periodically with time; (2) linear theory defines the regions of instability at which amplitudes increase exponentially; and (3) the amplitude-frequency response of systems experiencing parametric excitation can be obtained by including the relevant nonlinearities of the system. J.M.S.

N79-14405 Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 10, NO. 2
Feb. 1978 94 p refs
(AD-A050689/9) Avail: SVIC, Code 8404, Naval Research Lab., Washington, D. C. 20375 CSCL 20K

Technology developments in the field of shock and vibration are reviewed. Topics discussed include statistical energy analysis as applied to response of marine systems to vibration and the influence of nonlinearities on parametric vibrations. For individual titles, see N79-14406 through N79-14407.

N79-14406 Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
RECENT DEVELOPMENTS IN STATISTICAL ENERGY ANALYSIS
R. H. Lyon *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 10, No. 2 Feb. 1978 p 3-8 refs (For primary document see N79-14405 05-39)
Avail: SVIC, Code 8404, Naval Research Lab., Washington, D. C. 20375 CSCL 20K

A review of work related to the basic theory of and developments in statistical energy analysis is given. Applications in building structures and such marine systems as ship structures, buoy systems, and offshore towers are cited. Other topics covered include wave transmissiblities, impedances of structures, and modal densities. J.M.S.

N79-14407 Dundee Univ. (Scotland).
PARAMETRIC VIBRATION. PART 2: MECHANICS OF NONLINEAR PROBLEMS
R. A. Ibrahim (Arab Organ. for Industrialization, Cairo, Egypt) and A. D. S. Barr *In* Shock and Vibration Inform. Center The Shock and Vibration Digest, Vol. 10, No. 2 Feb. 1978 p 9-24 refs (For primary document see N79-14405 05-39)
Avail: SVIC, Code 8404, Naval Research Lab., Washington, D. C. 20375 CSCL 20K

The theory of parametric vibration is reviewed in terms of nonlinear problems. Single and multi-degree-of-freedom systems are discussed. Analytical and numerical methods used to solve problems of parametric and autoparametric vibrations are described. J.M.S.

N79-14408 Shock and Vibration Information Center (Defense), Washington, D. C.

THE SHOCK AND VIBRATION DIGEST, VOLUME 10, NO. 4

Apr. 1978 87 p refs

(AD-A053182/2) Avail: SVIC, code 8404, Naval Research Laboratory, Washington, D.C. 20375 CSCL 20K

Dynamic vibrational response analysis techniques are applied to mechanical engineering problems. For individual titles, see N79-14409 through N79-14410.

N79-14409 Sherbrooke Univ. (Quebec). Dept. of Mechanical Engineering.

IMPEDANCE METHODS FOR MACHINE ANALYSIS

M. Massoud and H. Pastorel *In* Shock and Vibration Center The Shock and Vibration Dig. Apr. 1978 p 9-18 refs (For primary document see N79-14408 05-39)

Avail: SVIC, code 8404, Naval Research Laboratory, Washington, D.C. 20375 CSCL 20K

Current impedance analysis techniques and their applications in the design and analysis of machines are considered. A background summary and basic definitions are followed by descriptions of current impedance measurement and testing techniques. Traditional applications are briefly surveyed. Recent applications involved preventive maintenance, crashworthiness, acoustic radiation, and the environment. Relevant publications are cited. Author

N79-14410# Arab Organisation for Industrialisation, Cairo (Egypt)9

PARAMETRIC VIBRATION. PART 4: CURRENT PROBLEMS (2)

R. A. Ibrahim *In* Shock and Vibration Center The Shock and Vibration Dig. Apr. 1978 p 19-47 refs (For primary document see N79-14408 05-39)

Avail: SVIC, code 8404, Naval Research Laboratory, Washington, D.C. 20375 CSCL 20K

Current problems in engineering applications having to do with pendulum systems, shafts, mechanisms and machine components, hydro and aeroelastic systems, and missiles and satellites are reviewed. G.G.

N79-14411*# National Aeronautics and Space Administration, Washington, D. C.

DEFORMATION AND DESTRUCTION OF SOLIDS

S. A. Shesterikov, ed. Dec. 1978 132 p refs Transl. into ENGLISH from Moscow State Univ. Inst. of Mech. Sci. Trans. (Moscow), no. 23, 1973 p 1-106 Transl. by ESDUCK (Franklin), Cairo, Egypt

(Contract NSF C-724)

(NASA-TT-F-17157; TT-77-58123) Avail: NTIS HC A07/MF A01 CSCL 20K

The strength of construction, elements of operating under conditions of elevated temperatures in the elastic zone, were considered. The rheological and plastic properties were also considered. Particular attention was paid to the performance of tubular elements and perforated plates, as well as to the mechanical properties of tube materials operating under conditions of cyclic loading. G.G.

N79-14412*# National Aeronautics and Space Administration, Washington, D. C.

STUDY ON PRESTRESSED CONCRETE REACTOR VESSEL STRUCTURES. II-5: CRACK ANALYSIS BY THREE DIMENSIONAL FINITE ELEMENTS METHOD OF 1/20 MULTICAVITY TYPE PCRV SUBJECTED TO INTERNAL PRESSURE

Dec. 1978 11 p refs Transl. into ENGLISH from Obayashi-Gumi Gijutsu Kenkyusho-Ho (Japan), No. 12, Feb. 1976 p 8-12 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-75213) Avail: NTIS HC A02/MF A01 CSCL 20K

A three-dimensional finite elements analysis is reported of the nonlinear behavior of PCRV subjected to internal pressure by comparing calculated results with test results. As the first stage, an analysis considering the nonlinearity of cracking in concrete was attempted. As a result, it is found possible to make an analysis up to three times the design pressure (50 kg/sqcm), and calculated results agree well with test results. G.G.

N79-14413*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THE EFFECT OF IMPACT DAMAGE AND CIRCULAR HOLES ON THE COMPRESSIVE STRENGTH OF A GRAPHITE-EPOXY LAMINATE

James H. Starnes, Jr., Marvin D. Rhodes, and Jerry G. Williams Oct. 1978 36 p refs

(NASA-TM-78796) Avail: NTIS HC A03/MF A01 CSCL 20L

Specimens were impacted by 1.27-cm-diameter aluminum spheres with speeds ranging from 52 to 101 m/s. Some specimens were impacted without any applied compressive load and then loaded to failure to determine their residual strength. Other specimens were loaded to a prescribed axial compressive strain and impacted while at that applied load. Loaded specimens that did not fail catastrophically on impact were subsequently loaded to failure to determine their residual strength. Low-velocity impact damage was found to degrade seriously the laminate static compressive strength. Low-strain compression-compression cyclic loading was found to degrade further the compressive strength of impact-damaged specimens. Specimens with circular holes having diameters up to a third of the specimen width were loaded to failure in compression. It was found that circular holes can also degrade the static compressive strength of the laminate. The effects of circular holes and impact damage on the compressive strength of the laminate are compared. S.B.S.

N79-14414*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

A USER'S GUIDE TO THE SUDAN COMPUTER PROGRAM FOR DETERMINING THE VIBRATION MODES OF STRUCTURAL SYSTEMS Ph.D. Thesis - Case Western Reserve Univ., Jun. 1963

Raymond G. Kvaternik and Barbara J. Durling Nov. 1978 51 p refs

(NASA-TM-78765) Avail: NTIS HC A04/MF A01 CSCL 20K

The use of the SUDAN computer program for analyzing structural systems for their natural modes and frequencies of vibration is described. SUDAN is intended for structures which can be represented as an equivalent system of beam, spring, and rigid-body substructures. User-written constraint equations are used to analytically join the mass and stiffness matrices of the substructures to form the mass and stiffness matrices of the complete structure from which all the frequencies and modes of the system are determined. The SUDAN program can treat the case in which both the mass and stiffness matrices of the coupled system may be singular simultaneously. A general description of the FORTRAN IV program is given, the computer hardware and software specifications are indicated, and the input required by the program is described. Author

N79-14415# Aeronautical Research Labs., Melbourne (Australia).

ON THE STRESS ANALYSIS OF PATCHED CRACKS

R. Jones and R. J. Callinan Jan. 1978 26 p refs

(ARL/Struc-367; AR-000-1113) Avail: NTIS HC A03/MF A01

A finite element method for analyzing the behavior of cracks in metal sheets, which are patched with an overlay of composite material, is described. The analysis includes the separate responses of the sheet, composite patch, and the adhesive. Debonding of the adhesive is permitted and the stress intensity factor at the crack tip is obtained as well as the stress distribution in the patch. J.M.S.

N79-14416# Polish Academy of Sciences, Warsaw. Dept. of the Theory of Continuous Media.

STRESS CONCENTRATION IN AN ELASTIC WEDGE

Marek Sokolowski 1978 19 p refs

Avail: NTIS HC A02/MF A01

The problem of an infinite elastic wedge bounded by two lines theta = phi, theta = - phi and loaded at the sides theta = + or - phi by two concentrated forces P acting at distances r sub o from the vertex O is considered. Point O is the origin of a Cartesian coordinate system x,y,z, and of a cylindrical coordinate system r, theta, z. The vertex angle of the wedge 2

theta varies between 0 and 2 pi. At phi = pi/2 the body forms a half-plane (or half-space, and at phi approaching the value of pi the system represents a plane (or space) containng a semi-infinite crack y = 0, x less than 0 loaded at the edges by two concentrated forces. Both the antiplane state of strain and the plane state of strain are considered. G.Y.

N79-14417# Naval Postgraduate School, Monterey, Calif.
A COMPUTER SUBROUTINE FOR STRESS ANALYSIS OF ROTATING DISKS, II
John E. Brock Aug. 1978 15 p ref
(RR0000101)
(AD-A059597; NPS-69-78-014) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report corrects errors in a previous report on the same subject and presents a listing of a revised and improved digital computer program for finding stress distribution in a thin rotating disk with nonuniform heating. Author (GRA)

N79-14418# Materials Research Lab., Inc., Glenwood, Ill.
FRACTURING CHARACTERISTICS OF ADHESIVE JOINTS Final Report, 16 Jan. 1976 - 16 Jan. 1977
Sheldon Mostovoy and E. J. Ripling Jul. 1978 82 p refs
(Contract N00019-76-C-0323)
(AD-A059440) Avail: NTIS HC A05/MF A01 CSCL 13/5

Experience in the commercial design and manufacture of adhesive joints has indicated that the most severe condition for adhesive joint fracture is the cleavage or pure mode-I condition. This commercial practice experience has been verified by the relatively small amount of well characterized fracture mechanics (FM) test data on pure mode-I and mixed-mode adhesive specimens. In fact, the lack of evidence for a degrading effect of shear loading is one of the most compelling reasons that more effort was not expended on mixed-mode adhesive FM methodology in the earlier studies. A second reason was that development of suitable mixed-mode specimens is considerably more difficult than has been the case for pure mode-I loading. Author (GRA)

N79-14419# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
STRESS ANALYSIS OF A RIGID BLOCK EMBEDDED IN AN ELASTIC HALF SPACE Ph.D. Thesis
George Konstantinos Haritos Aug. 1978 95 p refs
(AD-A059808; AFIT-CI-78-119) Avail: NTIS HC A05/MF A01 CSCL 20/11

This dissertation investigates the plane elasticity problem of a finite, rigid rectangular block partially embedded in, and perfectly bonded to an elastic half space. The bond thickness is assumed to be sufficiently thin, so that there is no discontinuity in the displacements of the bonded surfaces. The problem is formulated by superposition of the solutions to the problems of horizontal and vertical line inclusions beneath an elastic half space, which are derived from integral transform techniques. Substitution of these results into the boundary conditions appropriate for the embedded block problem leads to a system of six coupled singular integral equations, whose unknowns are the normal and shear stress discontinuities between the bonded surfaces. GRA

N79-14420# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
SCANNING AUGER ANALYSIS OF FRACTURE SURFACES IN GRAPHITE-ALUMINUM COMPOSITES Interim Report
Harris L. Marcus, Dennis L. Dull, and Maurice F. Amateau 25 Aug. 1978 22 p refs
(Contract F04710-77-C-0078)
(AD-A059688; TR-0078(3726-03)-2; SAMSO-TR-78-64) Avail: NTIS HC A03/MF A01 CSCL 11/2

Graphite-aluminum composites are being considered for numerous applications that require sufficient transverse strength to allow unidirectional fiber orientation for maximum stiffness and dimensional stability. The fiber-matrix bond strength must be maximized in order to achieve the required transverse properties. A recent study of the effect of processing and fiber type on the transverse strength of graphite-aluminum composites indicates that transverse fracture strength is dependent upon the nature of fiber-matrix interaction. The transverse strengths for these composites are in the range 5 to 40 MPa, depending upon the processing method and fiber type. An understanding of the fracture behavior of the interfaces between fiber and matrix is essential before processing improvements can be made to increase transverse composite strength. GRA

N79-14421# Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Materials Science.
ULTRASONIC AND ACOUSTIC EMISSION DETECTION OF FATIGUE DAMAGE Annual Report, 1 Mar. 1977 - 31 May 1978
Robert E. Green, Jr. and Robert B. Pond, Sr. Jul. 1978 48 p refs
(Contract F44620-76-C-0081)
(AD-A059433; AFOSR-78-1284TR; AR-2) Avail: NTIS HC A03/MF A01 CSCL 11/6

The purpose of the present research is to optimize existing ultrasonic and acoustic emission techniques and to investigate new ones for early detection of fatigue damage in aluminum alloys used in aircraft construction. Ultrasonic attenuation measurements made simultaneously with fatigue tests on aircraft aluminum alloy bars and sheets gave warning of crack formation and eminent fracture much earlier than conventional ultrasonic methods. An acoustic emission characterization system has been designed and constructed to record waveform and frequency spectra of the acoustic emission signals obtained at various stages of a test specimen's fatigue life. This system, which incorporates a capacitance transducer, permits superior characterization of acoustic emission signals unmodified by the detection transducer or by a videotape recorder. Use of an Admiralty Materials Laboratory (AML) acoustic emission transducer-cable-amplifier system permitted reliable acoustic emission measurements to be made during fatigue testing. The AML acoustic emission system and the ultrasonic attenuation system were used to simultaneously monitor the true rms-voltage of acoustic emission signals and changes in ultrasonic attenuation during fatigue testing of aluminum alloys bars. Author (GRA)

N79-14422# California Univ., Los Angeles. Dept. of Mechanics and Structures.
VIBRATION AND STABILITY ANALYSIS OF ARBITRARY STIFFENED SHELLS OF REVOLUTION
Allen J. Bronowicki and Richard B. Nelson Jul. 1978 38 p refs
(Contract N00014-76-C-0922)
(AD-A060344; UCLA-ENG-7841) Avail: NTIS HC A03/MF A01 CSCL 13/10

This report presents the analytical development of a finite element model suitable for a study of the elastic vibration and stability characteristics of a structure composed of a finite number of shells of revolution, each in the shape of a conical frustum. Thus, the model can be used to study a shell of revolution, with arbitrary meridional cross section, to which is attached arbitrarily shaped circumferential ring stiffeners and lateral bulkheads. The shell theory used to model each conical frustum is a third order Flugge-Lure-Byrne theory in which a complete interaction between shell membrane and bending effects occurs. The finite element models presented herein are to be basic elements in an analysis program designed specifically for use in a program for the automated structural design of submerged stiffened pressure vessels in the form of arbitrary structures of revolution. GRA

N79-14423# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
THE MEASUREMENT OF RESIDUAL STRESSES BY X-RAY DIFFRACTION TECHNIQUES
M. R. James and J. B. Cohen 26 Sep. 1978 113 p refs
(Contract N00014-75-C-0580)
(AD-A060349; TR-21) Avail: NTIS HC A06/MF A01 CSCL 20/11

The idea of measuring residual stresses by X-ray diffraction was first proposed by Lester and Aborn (1925). In this report the main aim is to present, in a single chapter, many of the recent instrumental advances and to explain the fundamental limitations associated with this measurement. Many current applications are described in those areas where the measurement has already proven to be useful. GRA

N79-14424# Weibull (Waloddi), Lausanne (Switzerland).
A TEST OF HOMOGENEITY BASED ON MAXIMUM LIKELIHOOD ESTIMATES Final Report, 15 Dec. 1973 - 15 Jan. 1974
Waloddi Weibull Apr. 1978 12 p ref
(Contract F44620-73-C-0066)
(AD-A058102; AFML-TR-78-27) Avail: NTIS HC A02/MF A01 CSCL 13/13

A sample is said to be homogeneous, if all its elements are drawn from the same population, otherwise heterogeneous. It is self-evident that there is no sense in estimating the parameters of an assumed distribution from heterogeneous samples. Considering the fact that samples of fatigue test data are frequently composed of elements drawn from two or even three populations, it is an important rule, frequently violated, to start statistical analyses of a given sample by stating whether it is homogeneous or not. A simple test based on the alternative maximum likelihood estimates of the complete sample and of the sample more or less truncated is presented. Author (GRA)

N79-14425# Defence Research Establishment Pacific, Victoria (British Columbia).
FATIGUE CRACK INITIATION PROPERTIES OF WELDED AND STRESS RELIEVED HY 130 STEEL
T. P. Nikiforuk and B. F. Peters Dec. 1977 32 p
(AD-A052695; DREP-77-A) Avail: NTIS HC A03/MF A01 CSCL 11/6

Fatigue initiation studies were performed on a potential hydrofoil material, HY130 steel, using a Tatnal-Krause type fatigue testing machine. The welded HY130 steel shows fatigue endurance properties of 480 MPa (70 Ksi) when in the ground and polished condition, the condition which would be present in the highly stressed areas of a foil. In the as-welded condition, the material shows an endurance limit of 240 MPa (35 Ksi) at a stress ratio of R = + 1/2. Author (GRA)

N79-14426# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
A NUMERICAL PROCEDURE FOR THE DYNAMIC PLASTIC RESPONSE OF BEAMS WITH ROTATORY INERTIA AND TRANSVERSE SHEAR EFFECTS Interim Report
J. Gomes DeOliveira and Norman Jones Aug. 1978 90 p refs
(Contract N00014-76-C-0195; NR Proj. 064-510)
(AD-A060302; Rept-78-2) Avail: NTIS HC A04/MF A01 CSCL 13/13

A numerical procedure is used to examine the influence of transverse shear forces in the yield criterion and rotatory inertia on the dynamic plastic response of beams. Various results are presented for a long beam impacted by a mass and a simply supported beam loaded impulsively, both of which are made from a rigid perfectly plastic material with yielding controlled by the I lyushin - Shapiro yield criterion. Transverse shear effects lead to a dramatic reduction in the slopes of the deformed profiles for both beam problems. Moreover, the slope of the deformed profile underneath the striker in the impact problem is quite sensitive to the actual shape of the yield curve, while the maximum transverse displacement is less sensitive. The retention of rotatory inertia in the basic equations leads to further reductions up to 17 and 10 per cent in the slopes and maximum transverse displacements, respectively. Author (GRA)

N79-14427# Purdue Univ., Lafayette, Ind. Joint Highway Research Project.
MAINTENANCE METHODS FOR CONTINUOUSLY REINFORCED CONCRETE PAVEMENTS Interim Report
Stanley J. Virkler Feb. 1978 90 p refs Sponsored in part by Federal Highway Admin. and Indiana State Highway Commission
(PB-286376/9; JHRP-78-1; FHWA-RD-75-S00776) Avail: NTIS HC A05/MF A01 CSCL 13B

Road sections were stratified into similar sections of pavement using deflection, cracking, and breakup as selection criteria. Various types of measures including concrete shoulders, undersealing, asphalt overlay, and installation of drains with various combinations of these methods were applied as a means for strengthening the pavements. In each case the pavement was patched prior to the installation of the maintenance technique. Soil samples that were obtained during the construction were tested and the soil and subbase characteristics were evaluated. A cost analysis was performed with a time frame of two years and an estimated cost for a third year of maintenance of the pavements. Overlay methods exhibited good behavior over the two years of service. GRA

N79-14428# California Univ., Richmond. Earthquake Engineering Research Center.
SEISMIC RESPONSE OF BRIDGES: CASE STUDIES
Roy A. Imbsen, Richard V. Nutt, and Joseph Penzien Jun. 1978 204 p refs
(Contract DOT-FH-11-7798)
(PB-286503/8; UCB/EERC-78/14) Avail: NTIS HC A10/MF A01 CSCL 13B

Presented are the results of 6 case studies conducted on each of three bridges when subjected to strong seismic excitation. The dynamic response of each bridge for separate excitations in the longitudinal and transverse directions were determined using the response spectral, linear time-history, and nonlinear time-history approaches. Maximum response values are interpreted in terms of current design procedures and code provisions. GRA

N79-14429# University of Southern Calif., Los Angeles. Dept. of Civil Engineering.
RANDOM VIBRATION OF A NONLINEAR TWO-DEGREE-OF-FREEDOM OSCILLATOR Topical Report, 1 Oct. 1977 - 30 Sep. 1978
S. J. Scott and S. F. Masri Aug. 1978 109 p refs
(Contract NRC-04-76-262)
(PB-287304/0; NUREG-CR-0361) Avail: NTIS HC A06/MF A01 CSCL 18E

An analytical and experimental investigation is made of the dynamic response of a nonlinear two-degree-of-freedom oscillator that models some of the basic phenomena involved in the response of complex nuclear power plant systems under dynamic environments. An approximate analytical solution is obtained for the stationary response of the system when subjected to stationary random excitation. Experimental measurements performed with an electronic analog computer and numerically simulated solutions generated by means of a digital computer verify the findings. Results are given for the power spectral density and root-mean-squared level of the response. The effects of various system parameters on the response of the nonlinear system are determined. GRA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N79-14430*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INDEPENDENT PEER EVALUATION OF THE LARGE AREA CROP INVENTORY EXPERIMENT (LACIE): THE LACIE SYMPOSIUM
Oct. 1978 41 p refs Symp. held at Houston, Tex. 23-26 Oct. 1978 Sponsored by NASA, USDA, and NOAA EREP
(E79-10009; NASA-TM-79904; JSC-14550) Avail: NTIS HC A03/MF A01 CSCL 02C

Yield models and crop estimate accuracy are discussed within the Large Area Crop Inventory Experiment. The wheat yield estimates in the United States, Canada, and U.S.S.R. are emphasized. Experimental results design, system implementation,

data processing systems, and applications were considered. For individual titles, see N79-14431 through N79-14437.

N79-14431*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN INDEPENDENT EVALUATION BY THE PLENARY PEER REVIEW TEAM
D. Paarlberg (Purdue Univ.), L. Eisgruber (Oregon State Univ.), B. A. Scherr (Data Resources, Inc.), H. O. Hartley (Texas A and M Univ.), D. Ingram (IBM), J. Quirein, D. Goodenough (Canadian Center for Remote Sensing), G. Nagy (Nebraska Univ., Lincoln), R. Holmes (GM Inst.), and R. Shay, Principal Investigators (Oregon State Univ.) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 1-8 refs EREP (For primary document see N79-14430 05-43)
Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14432*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE EXPERIMENT RESULTS PEER GROUP
L. Eisgruber (Oregon State Univ.), B. A. Scherr (Data Resources, Inc.), F. G. Hall (NASA. Johnson Space Center), B. Blad (Nebraska Univ.), W. Coberly (Tulsa Univ.), A. M. Feyerherm (Kansas State Univ.), G. Hanuschak (USDA Economics, Statistics, and Cooperatives Service, Washington, D. C.), K. Heiss (ECON, Inc.), F. Lamb (Eastern Oregon Farming Co.), and R. E. Selzer, Principal Investigators (Development Planning and Research, Assoc.) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 11-14 EREP (For primary document see N79-14430 05-43)
Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14433*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE EXPERIMENT DESIGN PEER GROUP
H. O. Hartley (Texas A and M Univ.), R. P. Heydorn (NASA. Johnson Space Center), J. Chromy (Research Triangle Inst.), L. Guseman (Texas A and M Univ.), D. Heerman (USDA Science and Education Administration, Fort Collins, Colo.), R. Thomas (California Univ., Berkeley), and L. Thompson, Principal Investigators (Iowa State Coll. of Agriculture) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 15-22 EREP (For primary document see N79-14430 05-43)
Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14434*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE SYSTEM IMPLEMENTATION AND OPERATIONS PEER GROUP
D. Ingram (IBM), J. Quirein Schlumberger, C. Johannsen (Missouri Univ.), J. L. Dragg (NASA. Johnson Space Center), S. DeGloria (California Univ., Berkeley), D. Saxton (NOAA Environmental Data and Information Service, Washington, D. C.), J. Sos, Principal Investigators (NASA. Goddard Space Center), and S. Wall (California Univ., Berkeley) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 23-26 EREP (For primary document see N79-14430 05-43)
Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14435*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE DATA PROCESSING SYSTEMS DESIGN PEER GROUP
D. Goodenough (Canadian Center for Remote Sensing), J. Sulester (NASA. Johnson Space Center), J. Kast (Purdue Univ.), and T. Phillips, Principal Investigators (Purdue Univ.) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 27-34 refs EREP (For primary document see N79-14430 05-43)
Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14436*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE USDA APPLICATIONS TEST SYSTEM PEER GROUP
G. Nagy (Nebraska Univ., Lincoln), J. D. Murphy (USDA Foreign Agricultural Service, Houston, Tex.), D. W. Cary (CIA), H. Harkness (Sparks Commodities, Inc.), R. Head (USDA Office of Automated Data Systems, Washington, D. C.), R. Henderson (MITRE Corp.), R. LeGault (ERIM), and R. McArdle, Principal Investigators (USDA World Food and Agricultural Outlook and Situation Board, Washington, D. C.) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 35-38 EREP (For primary document see N79-14430 05-43)
Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14437*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FINDINGS OF THE LACIE SUPPORTING RESEARCH PEER GROUP
R. Holmes (GM Inst.), R. Shay (Oregon State Univ.), J. D. Erickson (NASA. Johnson Space Center), W. Anderson (USGS), J. Estes (California Univ., Santa Barbara), C. Hay (California Univ., Berkeley), R. Jensen (NOAA National Weather Service, Honolulu, Hawaii), R. W. Leamer (USDA Science and Education Administration, Weslaco, Tex.), B. Liska (Purdue Univ.), and R. Welch, Principal Investigators (NASA. Ames Res. Center) *In its* Independent Peer Evaluation of the Large Area Crop Inventory Experiment (LACIE): The LACIE Symp. Oct. 1978 p 39-40 refs (For primary document see N79-14430 05-43)
Avail: NTIS HC A03/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14438*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SEVERE STORM ENVIRONMENTS: A SKYLAB EREP REPORT Final Report
David E. Pitts (NASA. Johnson Space Center), Yoshikazu Sasaki (Oklahoma Univ., Norman), and J. T. Lee, Principal Investigators (National Severe Storms Lab., Norman, Okla.) Aug. 1978 141 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10027; NASA-TM-58184) Avail: NTIS HC A07/MF A01 CSCL 04B
The results from the severe storm experiment over Texas and Oklahoma are presented. Correlation of data, soil moisture, water temperature, and cloud characteristics were considered. The sensors used in this study were multispectral band cameras, multispectral band scanners, infrared spectrometers, radiometers, and scatterometers. For individual titles, see N79-14439 through N79-14448.

N79-14439*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SEVERE STORM EXPERIMENT SUMMARY Final Report
David E. Pitts, Principal Investigator *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 5 p ref EREP (For primary document see N79-14438 05-43)
Avail: NTIS HC A07/MF A01 CSCL 04B
The author has identified the following significant results. The S194 L-band radiometer was well suited for the remote sensing of synoptic soil moisture over large areas under a wide variety of weather and terrain conditions. The S193 K-band radiometer was also found to be well suited for remote sensing of soil moisture at near nadir look angles but was more sensitive to the deleterious effects of surface roughness, vegetation cover, and cloud cover. The S193 K-band scatterometer had a high correlation with soil moisture for near nadir look angles but

exhibited no advantage over the passive measurements. Cloud street orientation was used in areas lacking radiosonde and surface meteorological observations as an indicator of low level wind flow. Cirrus clouds caused atmospheric effects on remote sensing of the earth surface in the visible, near infrared, and thermal infrared spectral regions. At times, these effects dominated both aerosol particulate scattering and gaseous absorption and reemission effects.

N79-14440*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DERIVED WATER TEMPERATURES USING S191 AND S192 DATA Final Report
David E. Pitts (NASA. Johnson Space Center) and W. Johnson, Principal Investigators (Lockheed Electronics Co., Houston, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 11 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14438 05-43)
Avail: NTIS HC A07/MF A01 CSCL 08H

The author has identified the following significant results. There is evidence that the cirrus clouds in the June 11 EREP data had a significant effect on both the S191 and S192 visible and infrared data. For S191 data, the cirrus clouds appeared to cause a 4- to 10 K decrease in equivalent black body temperature for wavelengths from 10.3 to 13 micrometers. A secondary observation was also apparent. Within the relatively small view of a satellite sensor, the error variability was approximately 7 K. This emphasized that the variability of the absorbing medium was so great that no amount of radiosonde observation could predict it accurately. Even ground-operated sensors would be of limited value in defining the four dimensional variability of the cirrus layers, except in a highly instrumented experimental situation.

N79-14441*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INVERSION OF S191 DATA INTO TEMPERATURE AND WATER VAPOR PROFILES Final Report
David E. Pitts (NASA. Johnson Space Center) and A. E. Dillinger, Principal Investigators (Lockheed Electronics Co., Houston, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 4 p ref EREP (For primary document see N79-14438 05-43)
Avail: NTIS HC A07/MF A01 CSCL 08H

There are no author-identified significant results in this report.

N79-14442*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE VARIATIONAL ANALYSIS OF JUNE 11, 1973, METEOROLOGICAL DATA Final Report
J. T. Lee (National Severe Storms Lab., Norman, Okla.) and Yoshikazu Sasaki, Principal Investigators (Oklahoma Univ., Norman) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 29 p refs EREP (For primary document see N79-14438 05-43)
Avail: NTIS HC A07/MF A01 CSCL 04B

There are no author-identified significant results in this report.

N79-14443*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE CORRELATION OF SKYLAB L-BAND BRIGHTNESS TEMPERATURES WITH ANTECEDENT PRECIPITATION Final Report
Marshall J. McFarland, Principal Investigator (Environmental Studies Service Center, College Station, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 15 p refs EREP (For primary document see N79-14438 05-43)
(Contract NAS9-13360)
Avail: NTIS HC A07/MF A01 CSCL 08M

There are no author-identified significant results in this report.

N79-14444*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SOIL MOISTURE STUDY USING THE S193 RADIOMETER Final Report
Bob E. Stucky, Principal Investigator (Lower Mississippi River Forecast Center, Slidell, La.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 14 p refs EREP (For primary document see N79-14438 05-43)
(Contract NAS9-13360)
Avail: NTIS HC A07/MF A01 CSCL 08M

There are no author-identified significant results in this report.

N79-14445*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
S193 SCATTEROMETER CORRELATION WITH SOIL MOISTURE Final Report
Bob E. Stucky, Principal Investigator (Lower Mississippi River Forecast Center, Slidell, La.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 6 p EREP (For primary document see N79-14438 05-43)
(Contract NAS9-13360)
Avail: NTIS HC A07/MF A01 CSCL 08M

There are no author-identified significant results in this report.

N79-14446*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RECTIFICATION OF A WHOLE-SKY PHOTOGRAPH AS A TOOL FOR DETERMINING SPATIAL POSITIONING OF CUMULUS CLOUDS Final Report
Bob E. Stucky, Principal Investigator (Lower Mississippi River Forecast Center, Slidell, La.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 10 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14438 05-43)
(Contract NAS9-13360)
Avail: NTIS HC A07/MF A01 CSCL 04B

There are no author-identified significant results in this report.

N79-14447*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SEVERE STORM CLOUD-TOP CHARACTERISTICS Final Report
David E. Pitts (NASA. Johnson Space Center), J. T. Lee (National Severe Storms Lab., Norman, Okla.), and W. Johnson, Principal Investigators (Lockheed Electronics Co., Houston, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 33 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14438 05-43)
Avail: NTIS HC A07/MF A01 CSCL 04B

The author has identified the following significant results. The combination of the thermal infrared and the near infrared bands near 1.0 to 2.0 micrometers provided sufficient information to determine whether a cell was young and growing, was mature, or was decaying. This, together with areal measurements of the amount of water in each phase over growing thunderstorms, could provide key inputs of mesoscale energy budgets for both developing air mass thunderstorms and squall line type thunderstorms. This data must be available on the scales of a few hundred meters and tens of minutes.

N79-14448*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
REMOTE SENSING OF ATMOSPHERIC WATER VAPOR Final Report
David E. Pitts (NASA. Johnson Space Center), J. T. Lee (National Severe Storms Lab., Norman, Okla.), and W. Johnson, Principal Investigators (Lockheed Electronics Co., Houston, Tex.) *In its* Severe Storm Experiments: A Skylab EREP Rept. Aug. 1978 10 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14438 05-43)
Avail: NTIS HC A07/MF A01 CSCL 04A

There are no author-identified significant results in this report.

N79-14449*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROCEEDINGS OF PLENARY SESSION: THE LACIE SYMPOSIUM
Oct. 1978 130 p refs Symp. held at Houston, Tex., 23-26 Oct. 1978 Sponsored by NASA, USDA, and NOAA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10028; NASA-TM-79906; JSC-14551) Avail: NTIS HC A07/MF A01 CSCL 02C

A technology assessment of the LACIE data processing and information systems was discussed during the Large Area Crop Inventory Experiment Symposium. Crop inventories of wheat yield in the United States as well as several other nations (such as the U.S.S.R., Canada, etc.) were discussed, along with the methodology involved in acquiring this data. For individual titles, see N79-14450 through N79-14457.

N79-14450*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE STATUS OF EXISTING GLOBAL CROP FORECASTING
Bruce A. Scherr (Data Resources, Inc.), William E. Kibler (USDA Economics, Statistics, and Cooperatives Service, Washington, D. C.), and Forrest G. Hall, Principal Investigators (NASA. Johnson Space Center) *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 1-16 refs EREP (For primary document see N79-14449 05-43)
Avail: NTIS HC A07/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14451*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE: AN EXPERIMENT IN GLOBAL CROP FORECASTING
R. B. MacDonald and F. G. Hall, Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 17-48 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14449 05-43)
Avail: NTIS HC A07/MF A01 CSCL 02C

The author has identified the following significant results. Both the accuracy and efficiency with which LACIE crop survey estimates were made have shown significant improvement in three years. In the U.S. and U.S.S.R. winter wheat regions, the original accuracy goals were met or exceeded, with 90/90 estimates achieved in the United States 1.5 to 2 months before harvest. Additionally, all available accuracy parameters indicate 90/90 estimates for the U.S.S.R. total crop. Key technology problems were identified during phase 2 with spring wheat in the United States and Canada which prevented the attainment of 90/90 accuracies in these regions. Technology solutions developed and tested in phase 3 partly resolved these issues with a significant improvement realized in the accuracy of the spring wheat area estimates.

N79-14452*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE APPLICATIONS EVALUATION SYSTEM: A DESIGN OVERVIEW
J. L. Dragg, W. E. Hensley, R. O. Hill, R. G. Musgrove, and T. T. White, Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 49-63 refs EREP (For primary document see N79-14449 05-43)
Avail: NTIS HC A07/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14453*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE LACIE SUPPORTING RESEARCH PROGRAM: A FOCUSED APPROACH TO RESEARCH AND DEVELOPMENT
Jon D. Erickson, Richard P. Heydorn, Milton C. Trichel, and Allen L. Grandfield, Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 65-89 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14449 05-43)
Avail: NTIS HC A07/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14454*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS IN SUPPORT OF LACIE AND FUTURE AGRICULTURAL RESEARCH PROGRAMS
Donald H. Hay, Principal Investigator *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 91-104 refs EREP (For primary document see N79-14449 05-43)
Avail: NTIS HC A07/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14455*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TECHNOLOGY TRANSFER: CONCEPTS, USER REQUIREMENTS, AND A PRACTICAL APPLICATION
J. D. Murphy (USDA Agricultural Stabilization and Conservation Service, Houston, Tex.), F. C. David (USDA Economics, Statistics, and Cooperatives Service, Houston, Tex.), R. E. Hatch (USDA Foreign Agricultural Service, Houston, Tex.), R. L. Packard (USDA Foreign Agricultural Service, Washington, D. C.), and D. Durica, Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 105-118 refs EREP (For primary document see N79-14449 05-43)
Avail: NTIS HC A07/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14456*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE IMPACT OF LACIE ON A NATIONAL METEOROLOGICAL CAPABILITY
N. Strommen (NOAA Environmental Data Information Service, Washington, D. C.), M. Reid (NOAA Environmental Data and Information Service, Houston, Tex.), and J. Hill, Principal Investigators *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 119-124 EREP (For primary document see N79-14449 05-43)
Avail: NTIS HC A07/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14457*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE OUTLOOK FOR SATELLITE REMOTE SENSING FOR CROP INVENTORY
R. Bryan Erb (NASA. Johnson Space Center), Robert E. Tokerud (Lockheed Electronics Co., Houston, Tex.), and Robert B. MacDonald, Principal Investigators (NASA. Johnson Space Center) *In its* Proc. of the Plenary Session: The LACIE Symp. Oct. 1978 p 125-131 EREP (For primary document see N79-14449 05-43)
Avail: NTIS HC A07/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14458*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BRIEFING MATERIALS FOR TECHNICAL PRESENTATIONS, VOLUME A: THE LACIE SYMPOSIUM
Oct. 1978 239 p Symp. held at Houston, Tex., 23-26 Oct. 1978 Sponsored by NASA, MSDA, and NOAA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(E79-10030; NASA-TM-79930; JSC-14557-Vol-A) Avail: NTIS HC A11/MF A01 CSCL 02C

Tables, charts, and outlines of various segments within the Large Area Crop Inventory Experiment are presented. Experiment design, system implementation and operations, and data

processing system design were considered. For individual titles, see N79-14459 through N79-14479.

N79-14459*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: EXPERIMENT DESIGN OVERVIEW
C. Hallum, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 1-6 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14460*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: SAMPLING AND AGGREGATION IN LACIE
C. Hallum, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 7-18 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14461*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: GROWTH STAGE ESTIMATION
V. Whitehead, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 19-20 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14462*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: WHEAT YIELD MODEL DEVELOPMENT
C. Sakamoto, Principal Investigator (NOAA) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 31-48 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14463*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: CLASSIFICATION AND MENSURATION APPROACH
R. P. Heydorn, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 49-68 Original contains imagery. Original photography may be purchased from EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14464*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT DESIGN SESSION: ACCURACY ASSESSMENT, THE STATISTICAL APPROACH TO PERFORMANCE EVALUATION
G. Houston, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 69-82 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14465*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: THE LACIE APPLICATION EVALUATION SYSTEM (AES), A DESIGN OVERVIEW
R. O. Hill, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 83-96 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14466*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: ACQUISITION AND PREPROCESSING OF LANDSAT DATA
L. Brown, Principal Investigator (NASA. Goddard Space Flight Center) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 97-102 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14467*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: CLASSIFICATION AND MENSURATION, AN APPROACH TO LANDSAT DATA ANALYSIS FOR CROP IDENTIFICATION
R. Biffell, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 103-120 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 08B
There are no author-identified significant results in this report.

N79-14468*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: IMPLEMENTATION AND OPERATION OF YIELD FORECASTING AND CROP GROWTH STAGE ESTIMATION
D. McCrary, Principal Investigator (NOAA) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 121-128 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14469*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: SYSTEM IMPLEMENTATION AND APPROACHES USED FOR GENERATION OF CROP PRODUCTION REPORTS
R. E. Hatch, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 129-140 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14470*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: ACCURACY ASSESSMENT, SYSTEM IMPLEMENTATION AND OPERATION
D. E. Pitts, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 141-163 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14471*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM IMPLEMENTATION AND OPERATIONS SESSION: LACIE AES EFFICIENCY REPORT
T. T. White, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p

165-173 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14472*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: DATA PROCESSING SYSTEMS OVERVIEW
D. H. Hay, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 175-183 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14473*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: EVOLUTION OF THE EARTH RESOURCES INTERACTIVE PROCESSING SYSTEM (ERIPS)
J. Lyon, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 185-191 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14474*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: DATA BASE DESIGN CONSIDERATIONS
L. Westberry, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 193-204 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14475*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: MAN-MACHINE INTERFACE IN LACIE ERIPS
B. Duprey, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 205-214 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14476*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: VERY HIGH SPEED PROCESSING AS RELATED TO PIXEL-DEPENDENT TASKS
J. Lyon, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 215-214 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14477*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: THE CARTOGRAPHIC LABORATORY
M. Rader, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 225-234 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14478*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: SOME COST PERFORMANCE CHARACTERISTICS OF SEVERAL DATA SYSTEM CONFIGURATIONS FOR PROCESSING REMOTELY SENSED DATA
P. Gregor, Principal Investigator (MITRE Corp.) *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 235-248 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14479*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DATA PROCESSING SYSTEMS DESIGN SESSION: EQUIPMENT SELECTION CRITERIA FOR R AND D IMAGE PROCESSING
E. Poole, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. A: The LACIE Symp. Oct. 1978 p 249-259 EREP (For primary document see N79-14458 05-43)
Avail: NTIS HC A11/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14480*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
BRIEFING MATERIALS FOR TECHNICAL PRESENTATIONS, VOLUME B: THE LACIE SYMPOSIUM
Oct. 1978 251 p Symp. held at Houston, Tex., 23-26 Oct. 1978 Sponsored by NASA, USDA, and NOAA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (E79-10031; NASA-TM-79929; JSC-14557-Vol-B) Avail: NTIS HC A12/MF A01 CSCL 02C
Tables, charts, and LACIE segments are used to demonstrate the accuracy of estimated crop conditions and yield from 1974 to 1976, and to demonstrate the benefits of meteorological and LANDSAT data. Developments in data acquisition, sampling, and reduction are reviewed. The USDA application test system is highlighted with emphasis on user requirements, technology transfer, data base design, and cost data models for data base operation and management. For individual titles, see N79-14481 through N79-14498.

N79-14481*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: LACIE CROP YEARS, AN ASSESSMENT OF CROP CONDITIONS
J. Hill, Principal Investigator (NOAA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 261-288 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14482*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: ACCURACY AND PERFORMANCE OF LACIE ESTIMATES
G. Houston, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 293-316 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14483*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: ACCURACY AND PERFORMANCE OF LACIE YIELD ESTIMATES
D. Phinney, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 317-332 EREP (For primary document see N79-14480 05-43)

Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14484*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: ACCURACY AND PERFORMANCE OF LACIE CROP DEVELOPMENT MODELS
S. Woolley, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 333-343 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14485*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EXPERIMENT RESULTS SESSION: ECONOMIC EVALUATION; CONCEPTS, SELECTED STUDIES, SYSTEM COST, AND A PROPOSED PROGRAM
F. Osterhoudt, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 345-360 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14486*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: SUPPORTING RESEARCH, A FOCUSED APPROACH TO RESEARCH DEVELOPMENT
J. Erickson, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 361-376 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14487*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: METHODS FOR SEGMENT WHEAT AREA ESTIMATION
R. P. Heydorn, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 377-393 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14488*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: MANUAL IDENTIFICATION OF CROP TYPES
C. Hay, Principal Investigator (California Univ., Berkeley) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 395-411 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14489*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: STATUS OF YIELD ESTIMATION TECHNOLOGY, A REVIEW OF SECOND-GENERATION MODEL DEVELOPMENT
R. Stuff, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 413-435 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14490*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: PREDICTION OF WHEAT PHENOLOGICAL DEVELOPMENT, A STATE-OF-THE-ART REVIEW
M. Seeley, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 435-447 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14491*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUPPORTING RESEARCH AND TECHNOLOGY (SRT) SESSION: NEW DEVELOPMENTS IN SAMPLING AND AGGREGATION FOR REMOTELY SENSED SURVEYS
A. Feiveson, Principal Investigator *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 449-463 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14492*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: TECHNOLOGY TRANSFER; CONCEPTS, USER REQUIREMENTS, AND THEIR PRACTICAL APPLICATION
J. D. Murphy, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 469-477 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14493*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: THE APPLICATION TEST SYSTEM, AN APPROACH FOR TECHNOLOGY TRANSFER
F. C. David, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 479-487 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14494*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: FUNCTIONAL DEFINITION AND DESIGN OF A USDA SYSTEM
S. Evans, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 489-496 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14495*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: ATS, TECHNICAL APPROACH AND SYSTEM DESIGN
R. Hurst, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 497-505 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C
There are no author-identified significant results in this report.

N79-14496*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: DATA BASE DESIGN FOR A WORLDWIDE MULTICROP INFOR-

MATION SYSTEM
G. Driggers, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 507-517 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14497*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: ATS EXPERIENCE TO DATE AND FUTURE PLANS
G. May, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 519-531 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A12/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14498*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USDA APPLICATION TEST SYSTEM (ATS) SESSION: RESOURCE MODELLING, A REALITY FOR PROGRAM COST ANALYSIS
L. Fouts, Principal Investigator (USDA) *In its* Briefing Mater. for Tech. Presentations, Vol. B: The LACIE Symp. Oct. 1978 p 533-543 EREP (For primary document see N79-14480 05-43)
Avail: NTIS HC A13/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-14499*# New Technology, Inc., Huntsville, Ala.
REMOTE SENSING DATA HANDBOOK
31 Jul. 1978 469 p
(Contract NAS8-31423)
(NASA-CR-150837) Avail: NTIS HC A20/MF A01 CSCL 14B

A digest of information on remote sensor data systems is given. It includes characteristics of spaceborne sensors and the supportive systems immediately associated therewith. It also includes end-to-end systems information that will assist the user in appraising total data system impact produced by a sensor. The objective is to provide a tool for anticipating the complexity of systems and potential data system problems as new user needs are generated. Materials in this handbook span sensor systems from the present to those planned for use in the 1990's. Sensor systems on all planned missions are presented in digest form, condensed from data as available at the time of compilation. Projections are made of anticipated systems. G.Y.

N79-14500*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE AD HOC MARS AIRPLANE SCIENCE WORKING GROUP Final Report
V. C. Clarke, Jr. 1 Nov. 1978 51 p refs
(Contract NAS7-100)
(NASA-CR-158000; JPL-Pub-78-89) Avail: NTIS HC A04/MF 01 CSCL 01C

The capability of a remotely piloted airplane as a Mars exploration vehicle in the aerial survey mode is assessed. Specific experiment areas covered include: visual imaging; gamma ray and infrared reflectance spectroscopy; gravity field; magnetic field and electromagnetic sounding; and atmospheric composition and dynamics. It is concluded that (1) the most important use of a plane in the aerial survey mode would be in topical studies and returned sample site characterization; (2) the airplane offers the unique capability to do high resolution, oblique imaging, and repeated profile measurements in the atmospheric boundary layer; and (3) it offers the best platform from which to do electromagnetic sounding. J.M.S.

N79-14501*# National Aeronautics and Space Administration, Washington, D. C.
APPLICATION OF LANDSAT IMAGES IN THE MINAS GERAIS TECTONIC DIVISION
Roberto Pereira daCunha and Juercio Tavares deMattos Dec. 1978 26 p refs Transl. into ENGLISH of "Aplicacao de Imagens LANDSAT na Compartimentacao Tectonica de Minas Gerais", Rept. INPE-1325-PE/155 Inst. de Pesquisas Espaciais, Sao Paulo, Brazil, Aug. 1978 14 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75584; INPE-1325-PE/155) Avail: NTIS HC A03/MF A01 CSCL 08G

The interpretation of LANDSAT data for a regional geological investigation of Brazil is provided. Radar imagery, aerial photographs and aeromagnetic maps were also used. Automatic interpretation, using LANDSAT OCT's was carried out by the 1-100 equipment. As a primary result a tectonic map was obtained, at 1:1,000,000 scale, of an area of about 143,000 square kilometers, in the central portion of Minas Gerais and Eastern Goias States, known as regions potentially rich in mineral resources. G.G.

N79-14502*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 3 WORLD STANDARD CATALOG, 1-30 SEPTEMBER 1978
30 Sep. 1978 175 p
(NASA-TM-79887; GSFC/LWC/3-78/09; NTISUB/D/277-009) Avail: NTIS HC A08/MF A01 CSCL 05B

Imagery acquired by LANDSAT 3 which was processed and input to the data files during the referenced month is listed. Data, such as data acquired, cloud cover, and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. G.G.

N79-14503*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 2 WORLD STANDARD CATALOG, 1-30 SEPTEMBER 1978
30 Sep. 1978 92 p
(NASA-TM-79886; GSFC/LWC/2-78/09; NTISUB/D/276-009) Avail: NTIS HC A05/MF A01 CSCL 05B

Imagery acquired by LANDSAT 2 which was processed and input to the data files during the referenced month is listed. Data, such as data acquired, cloud cover, and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. G.G.

N79-14504*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TRANSFER FUNCTION TESTS OF THE JOY LONGWALL SHEARER
Paul H. Fisher, Jr. Dec. 1978 88 p
(NASA-TM-78208) Avail: NTIS HC A05/MF A01 CSCL 08I

A series of operational tests was performed on the Joy longwall shearer located at the Bureau of Mines in Bructon, Pennsylvania. The purpose of these tests was to determine the transfer function and operational characteristics of the system. These characteristics will be used to generate a simulation model of the longwall shearer used in the development of the closed-loop vertical control system. Author

N79-14505# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DEVELOPMENT OF AN AUTOMATIC MAP DRAWING SYSTEM [DESENVOLVIMENTO DE TRACADO AUTOMATICO DE MAPAS]
Mag Pacheco, Nandamudi L. Vijay Kumar, and Jose Antonio G. Pereira Nov. 1978 16 p refs In PORTUGUESE; ENGLISH summary
(INPE-1396/PE/186) Avail: NTIS HC A02/MF A01

Two of the most general methods of graphic representation (by computer) of functions are presented: the drawing of contour lines and the plane projection in perspective. Bi-variate functions, which can be defined by a set of measured arbitrary points or by algebraic expressions, are specially treated. Particular problems of these representations are mentioned, such as: grid types,

interpolation methods to obtain values of the grid points and contour lines as well as methods to remove hidden lines. Author

N79-14506# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
DETERMINING COORDINATES OF THE ROTATIONAL POLE USING SATELLITE DATA FROM FOUR SITES
V. L. Pisacane and S. C. Dillon Jul. 1978 27 p refs Sponsored by the Navy
(AD-A059480; APL/JHU-CP-068) Avail: NTIS HC A03/MF A01 CSCL 08/5

This study investigates how precisely the terrestrial coordinates of the rotational pole can be determined from satellite data from four sites in the U.S. The five satellites used are those of the Navy Navigation Satellite System (TRANSIT). Tracking data for these satellites are Doppler observations from sites in Maine, Minnesota, California, and Hawaii. The data used in the study are intermediate data products of the near-real-time orbit determination procedure, which is an integral part of the navigation system operations. Six five-day intervals were selected for study, one every other month during 1976. Coordinates were determined daily from five satellites. Five-day averages were used as final coordinates. Comparisons were made with extrapolated and final coordinates from the Bureau International de l'Heure (BIH) and final coordinates from the Doppler Polar Motion Service (DPMS). The final coordinates determined in the study agree as well with the final values of BIH as do the results of DPMS. The study implies that low-cost and near-real-time estimates of the terrestrial coordinates of the pole can be made available daily as a by-product of the routine support needed for the Navy Navigation Satellite System. Author (GRA)

N79-14507# Civil and Environmental Engineering Development Office, Tyndall AFB, Fla.
FLAME: FORESTRY LANDS ALLOCATED FOR MANAGING ENERGY. FEASIBILITY STUDY Final Report, Jun. - Aug. 1978
James D. Lowther Sep. 1978 28 p refs
(AD-A059993; CEEDO-TR-78-41) Avail: NTIS HC A03/MF A01 CSCL 21/4

This study evaluated the feasibility of using wood grown on USAF installations as fuel to supply the heating energy requirements of the installations, replacing conventional fossil fuels currently being used. Arnold Engineering Development Center, Tennessee; Barksdale AFB, Louisiana; Eglin AFB, Florida; and Tyndall AFB, Florida have the potential for supplying significant portions of their heating energy requirements with non-merchantable timber grown on the installations. Avon Park Air Force Range, Florida has the potential to supply its own small heating energy requirements plus those of MacDill AFB, which is 75 miles away. Arnold Engineering Development Center presently has a central plant heating system. The system can be converted to a wood-burning system by altering existing boilers or replacing them with boilers having wood-firing capability. The remaining installations do not have central plant heating systems, but use small natural gas and oil-fired heating units in individual buildings. Conversion of these installations to burn wood would require construction of a wood-fired central system or systems. An alternate method of converting these installations is through the use of a pyrolysis unit to convert wood to fuel gas and fuel oil which can be burned in existing heating units. The latter alternative cannot be implemented until a large scale, continuously operated pyrolysis unit is developed. Author (GRA)

N79-14508# Decilog, Inc., Melville, N. Y.
SYSTEM ANALYSIS OF THE ENTIRE TOPOGRAPHIC SUPPORT SYSTEM (TSS) Interim Report, 1 Oct. 1977 - 1 Jun. 1978
Robert S. Colombo, C. Thomas Goldsmith, Andrew Maceiko, and Clinton D. Upham 15 Jul. 1978 85 p refs
(Contract DAAK70-77-C-0275)
(AD-A060171; R-187) Avail: NTIS HC A05/MF A01 CSCL 08/6

The Topographic Support System (TSS) is intended to supply all of the Army's requirements for topographic and military geographic information during a short, high intensity combat situation. The purpose of the System Analysis, which is described in this report, was to determine: whether or not the TSS had over or under capacity; to locate 'bottlenecks', (if any), in the TSS which restrict production flow; and to recommend solutions to problems, if any were detected. A discrete events System Simulation Model was utilized as the analysis tool. The language is one that is commonly used in the analysis of large-scale assembly and production facilities, warehousing operations, etc. A 'scenario', consisting of 39 different product requests, together with their frequency of occurrence, priority, number of originals and final copies, etc., was generated. These product requests were entered into the TSS at the rate of three per hour for a 144-hour period, both to simulate the high intensity combat environment and also to stress the system. GRA

N79-14509# L N K Corp., Inc., Silver Spring, Md.
TOWARD AUTOMATIC EXTRACTION OF CARTOGRAPHIC FEATURES Final Report
George Stockman Jul. 1978 129 p refs
(Contract DAAK70-77-C-0110)
(AD-A059942; ETL-0153) Avail: NTIS HC A07/MF A01 CSCL 08/2

The problem of automatically extracting map symbology from source imagery is studied. It is concluded that a great deal of geographic knowledge used by humans, who currently perform this extraction function, must be made available to machines before the function can be automated. Several geographic knowledge sources are discussed and an attempt is made to define paradigms under which knowledge can be encoded and used in the computer. An automatic cartographic feature extraction system (ACES) is sketched which represents a best framework for continuing development on this difficult problem given current achievements. A systems approach is taken with first consideration given to desired outputs and available inputs. It is concluded that input/output technology is far in advance of technology available for interpretation of the data. Emphasis is placed on the use of knowledge by ACES during automatic interpretation of imagery. Many types of knowledge typically used by humans appear difficult to engineer into automatic processes. Use of positional knowledge encoded in a geographic data base (GDB) is selected as the most promising avenue. Proposals are given for future research work in that direction. Author (GRA)

N79-14510# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
STATISTICAL ANALYSIS OF SELECTED TERRAIN AND WATER BACKGROUND MEASUREMENTS Final Report
J. Robert Maxwell Jul. 1978 152 p refs
(Contract N00123-77-C-0682)
(AD-A060153; ERIM-132300-1-F) Avail: NTIS HC A08/MF A01 CSCL 17/5

Terrain and water background measurement data in the mid-IR have been collected and analyzed in support of the Navy Optical Signature Program. This is a continuing program to provide representative backgrounds data for various system performance studies. Calibrated digital data tapes of the backgrounds data are maintained as part of the program. Selected data over desert and mountainous terrain at Nellis AFB, over a rural and urban terrain in West Virginia, and over water at Pt. Mugu were analyzed in several spectral bands in the IR and mid-IR including 2.0 - 2.6, 3.5 - 3.9, 3.9 - 4.7, 4.5 - 5.5, 5.1 - 5.7, and 9.0 - 11.4 micrometer. Of the extensive data available at Nellis, the data that were selected for statistical analysis provided a comparison of desert and mountainous terrain, downward and 35 degree depression angle data, morning and afternoon data and data at 1000 ft. and 5000 ft. altitude. Statistics and a discussion of the statistical analysis is presented in the report including means, standard deviations, histograms, hot spot (ellipse) analyses, spectral correlations, and power spectra. Author (GRA)

N79-14511# General Electric Co., Beltsville, Md. Space Div.
LANDSAT D: CORPS OF ENGINEERS INTERFACE WITH ADVANCED NASA GROUND SYSTEMS STUDY
T. Aepli, J. Brooks, A. Carafides, W. Dallam, and A. Park Jun. 1978 153 p refs
(Contract DAAK70-77-C-0237)
(AD-A059628; DOC-78SDS4248; ETL-0151) Avail: NTIS HC A08/MF A01 CSCL 09/2

The object of the study was to determine and analyze alternative interface with the LANDSAT D ground data distribution

system. The approach taken was to identify and define the requirements for data needed to meet the demands of the Civil Works Operation. These were then used as criteria for structuring alternative system options. The key issues emanating from the requirements portion of the study are: perishability of the data volumes required in each district. LANDSAT A data path was investigated with regard to these data needs leading to identification of access paths and data availability. Also, a characterization of the media of data transmission was provided. This report discusses the parameters that must be considered to effectively evaluate the alternatives that are available to the COE for interfacing with the LANDSAT D data system. Key issues of several alternatives are characterized. Author (GRA)

N79-14512# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 1: INTRODUCTION
Apr. 1978 44 p refs 6 Vol.
(PB-285747/2) Avail: NTIS HC A03/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

Recommendations for determining the adequacy of existing programs and policies for meeting the water requirements in each water resources region of the U.S. are proposed. GRA

N79-14513# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 2: WATER MANAGEMENT PROBLEM PROFILES
Apr. 1978 150 p refs 6 Vol.
(PB-285748/0) Avail: NTIS HC A07/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

A general water balance analysis is presented for each of 106 subregions indicating the scope of critical water quantity, quality, and related land problems. The nature of each problem, its implications and options for resolution are discussed for inadequate water supply; ground water depletion; surface water pollution; ground water contamination; domestic water supply contamination; flooding; erosion and sedimentation; drainage, and bay, estuary, and coastal waters. The impact of each is examined with respect to public health, environmental quality, economic efficiency, resources conservation, international relations, pervasiveness, and urgency. The names of the regions and aggregated subregions studied are included. GRA

N79-14514# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 3: FUNCTIONAL WATER USES
Apr. 1978 386 p refs 6 Vol.
(PB-285749/8) Avail: NTIS HC A17/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

The national perspectives regarding existing (1975) and future (1985 and 2000) requirements for water to meet economic and social needs for basic products, services, and environmental conditions are presented. Offstream uses discussed include domestic and industrial needs, manufacturing and related functions, and the production of energy, food, fibers and minerals. Instream requirements are analyzed for recreation activities, navigation requirements, fish and wildlife habitats and the maintenance of natural areas. Flow management is examined in relation to flood damage, erosion, and sedimentation. State and regional viewpoints are considered separately for situations in which there are major viewpoint differences or projections. GRA

N79-14515# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 4: WATER SUPPLY AND WATER QUALITY CONSIDERATIONS
Apr. 1978 99246 p refs 6 Vol.
(PB-285750/6) Avail: NTIS HC A11/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

The atmospheric, surface, and ground water resources of the United States were analyzed to determine methods for augmenting and conserving the nation's water supply to meet national water and regional requirements. A water supply adequacy analysis model is presented. The problem of water pollution is examined with emphasis on its sources and control. Water quality issues related to point and nonpoint sources are considered and the legal and institutional aspects of water allocation and management are explored. GRA

N79-14516# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. PART 5: REGIONAL ASSESSMENT SUMMARIES
Apr. 1978 206 p 6 Vol.
(PB-285751/4) Avail: NTIS HC A10/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

Estimates are made of physical and socio-economic data based on goals and objectives of the various states in the New England, MidAtlantic, South Atlantic Gulf, Rio Grande, Great Basin, and the Pacific Northwest regions of the U.S. GRA

N79-14517# Water Resources Council, Washington, D.C.
THE NATION'S WATER RESOURCES, THE SECOND NATIONAL WATER ASSESSMENT. APPENDIX B: METHODOLOGIES AND SOCIO-ECONOMIC CHARACTERISTICS AND PATTERNS OF CHANGE AND WATER USE AND WATER SUPPLY DATA
Apr. 1978 101 p refs 6 Vol.
(PB-285815/7) Avail: NTIS HC A06/MF A01; also available in set of 6 reports HC E17, PB-285745-SET CSCL 13B

Basic assumptions and analytical methods used to determine state and regional water use and supply and to prepare a future scenario of economic and social needs for basic products, services, and environmental conditions are presented. GRA

N79-14518# Nevada Univ., Reno. Desert Research Inst.
PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY
P. T. Tueller Apr. 1978 33 p refs
(OWRT Proj. A-064-NEV(1))
(PB-286122/7; PUB-AG-2; PUB-43005; W78-11336) Avail: NTIS HC A03/MF A01 CSCL 08H

Data gathered from the field and subsequent calculations, reasonably accurate figures concerning future water resources can be forecasted from snow course measurements. The feasibility of improving runoff and stream flow prediction using sequential satellite imagery was investigated. Correlations between snow line changes in the Humboldt River Basin on the 1973 imagery and predicted runoff on various tributaries having streamflow gages were developed. A preliminary runoff prediction model for the Humboldt River water shed based on these calculations is presented. GRA

N79-14519# Cornell Univ., Ithaca, N. Y. Center for Environmental Research.
POLICY AND PROGRAM ANALYSIS OF AN OPEN LAND APPROACH TO FLOOD PLAIN MANAGEMENT Technical Completion Report
Jack P. Royer, Bruce T. Wilkins, and David J. Allee Aug. 1978 133 p refs
(Contract DI-14-34-0001-7170)
(PB-285930/4; W78-11201; OWRT-B-056-NY(1)) Avail: NTIS HC A07/MF A01 CSCL 08H

A land use strategy frequently considered is the acquisition and use of flood plains for parks, open spaces, and other non-intensive uses. A case study of communities in the Susquehanna River Basin of southern New York was used to identify land use patterns important to a policy of acquiring flood-prone land, to examine the economic rationale for an open land approach, and to assess the political viability of an open land strategy. GRA

N79-14520# Colorado State Univ., Fort Collins. Environmental Resources Center.
MODELLING THE DYNAMIC RESPONSE OF FLOOD PLAINS TO URBANIZATION IN EASTERN NEW ENGLAND
Donald O. Doehring and Mark E. Smith Jan. 1978 102 p refs
(Contract DI-14-34-0001-6163; OWRT Proj. B-147-COLO(1))
(PB-285708/4; COMPLETION-83; W78-11064) Avail: NTIS HC A06/MF A01 CSCL 08H

Flood hazard delineation in the United States was usually based on the assumption that one percent annual flood expectancy is static, and that subsequent urbanization of the catchment will have no significant impact on that expectancy. Research demonstrates that this assumption is incorrect in certain settings where the hydrologic response of a watershed to extensive urban growth is conditioned by geologic, pedalogic and morphometric parameters. These relationships were synthesized into an algorithm which predicts the change in discharge corresponding to indices of urban land use changes, superficial properties of the catchment, and the configuration of the network of drainage. Flood expectancies were calculated by standard statistical analyses of annual maxima. The final algorith was developed by a stepwise multiple regression technique and utilized data from 18 watersheds in southeastern New England. GRA

N79-14521# Bureau of Mines, Washington, D. C.
BUREAU OF MINES RESEARCH 1977. A SUMMARY OF SIGNIFICANT RESULTS IN MINING, METALLURGY, AND MINERAL ECONOMICS
1977 147 p refs
(PB-284743/2; BM-SP-2-78) Avail: NTIS HC A07/MF A01 CSCL 08I

Significant research projects and mineral studies conducted by the Bureau of Mines are described. Areas of discussion include helium activities, coal preparation, mineral processing, hydrometallurgy, pyrometallurgy, secondary resource recovery, advanced mining techniques, health and safety, and mineral and materials supply/demand analysis. GRA

N79-14522# Geological Survey, Tallahassee, Fla. Water Resources Div.
METHODS OF ESTIMATING RECHARGE TO THE FLORIDAN AQUIFER IN NORTHEAST FLORIDA
G. G. Phelps May 1978 24 p refs Supersedes USGS/WRD/WRI-78/020 Prepared in cooperation with City of Jacksonville, Fla.
(PB-284901/6; USGS/WRD/WRI-78/059; USGS/WRI-77-109; USGS/WRD/WRI-78/020) Avail: NTIS HC A02/MF A01 CSCL 08H

Recharge to the principal artesian aquifer in a six-county area in northeast Florida was calculated using closed contour methods, water budgets, and formulas for computing leakage through confining beds. Each estimate was then tested in a computer model of groundwater flow to see which estimate was best. Calculations of flow midway between the 24 and 21 meter potentiometric contours show a total flow of 164,000 cubic meters per day, a significant part of which must be recharged within the closed 24 meter contour. Flow midway between the 18 and 15 meter contours was calculated to be 342,000 cubic meters per day. A water budget for the same area in water year 1972 indicates a potential recharge rate of 1,670,000 cubic meters per day based on average annual data. GRA

N79-14523# Utah Water Research Lab., Logan.
MATHEMATICAL MODELING OF A SOCIOLOGICAL AND HYDROLOGIC DECISION SYSTEM Water Resources Planning Series
Wade H. Andrews, J. Paul Riley, and Malcolm B. Masteller Jun. 1978 190 p refs Prepared in cooperation with the Inst. for Social Sci. Res. on Nat. Resources, Logan, Utah
(Contract DI-14-31-0001-4207)
(PB-285803/3; UWRL-P-78/004; W78-11061; OWRT-C-5177(4207)(1); ISSR-Research-Mono-7) Avail: NTIS HC A09/MF A01 CSCL 08H

The general goal was to develop a functional model of the sociological and related hydrologic elements in flood control decision-making. Conceptual system models were developed for the hydrologic system and for the sociological system. The sociological variables were identified as they related to the steps in the process of the model. Following the conceptual decision process model, the social elements of the model were calibrated from data obtained from field studies and mathematical equations were developed and tested. Finally, simulations of the process were run. After adjustments were made the model was found to function. Several methodological factors were devised to make the model more realistic and operable. These concepts permit the model to adjust to changes in social behavior related to the social structure of the decision process. GRA

N79-14524# Texas A&M Univ., College Station. Water Resources Inst.
INSTITUTIONAL ARRANGEMENTS FOR EFFECTIVE GROUNDWATER MANAGEMENT TO HALT LAND SUBSIDENCE Technical Report, 1 Jul. 1975 - Dec. 1977
William J. Brah and Lonnie L. Jones May 1978 195 p refs
(Contract DI-14-34-0001-6122)
(PB-285786/0; TR-95; W78-11057; OWRT-B-200-TEX(1)) Avail: NTIS HC A09/MF A01 CSCL 13B

Alternative political and economic structures were evaluated for comprehensive management of the complex water problems to halt land subsidence in the Texas Gulf Coastal area of Harris and Galveston counties. Alternative arrangements of legal, economic and political institutions with the capacity and ability to conjunctively manage regional ground and surface water resources to abate and control subsidence were developed and examined. These alternative institutional arrangements are based on both practical and theoretical management methods advanced in the literature on water resource management for solving commonality problems in the use of groundwater resources. GRA

N79-14525# North Dakota Water Resources Research Inst., Fargo.
THE INVENTORY AND DISTRIBUTION OF WATER AND ASSOCIATED LAND RESOURCES IN THE GARRISON/DEVILS LAKE REGION OF ND: AN APPLICATION OF RESOURCE DATA ACQUIRED Completion Report, May 1975 - May 1978
Roland D. Mower May 1978 29 p refs
(Contract DI-14-34-0001-7072)
(PB-286091/4; WI-221-047-78; W78-11373; OWRT-A-047-NDAK(1)) Avail: NTIS HC A03/MF A01 CSCL 13B

This study was designed to inventory and spatially analyze water and land resources in the Garrison/Devils Lake Region of North Dakota using resource data acquired by ERTS. Preliminary land use studies in Mercer County involved the interpretation of black and white, and color infrared (CIR) aerial photographic imagery (1:24,000), a LANDSAT color composite image (1:250,000), a Mead Dijit Graphics Generator (DGG) image (1:225,000), and a Mead Digital Laser Printer (DLP) image (1:600,000). Subsequent land use/land cover research in the Devils Lake Basin has included the interpretation and analysis of LANDSAT computer compatible tape (CCT) data. The results of this study, in both tabular and graphic format, have been made available to various planning agencies in North Dakota and to all special task force units established by the Devils Lake Committee. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N79-14526* National Aeronautics and Space Administration. Pasadena Office, Calif.
SUN TRACKING SOLAR ENERGY COLLECTOR Patent
Gerald S. Perkins, inventor (to NASA) (JPL) Issued 5 Sep. 1978 6 p Filed 6 Apr. 1977 Supersedes N77-24590 (15 - 15, p 2010) Sponsored by NASA
(NASA-Case-NPO-13921-1; US-Patent-4,111,184; US-Patent-Appl-SN-785257; US-Patent-Class-126-270; US-Patent-Class-126-271) Avail: US Patent and Trademark Office CSCL 10A

A parabolic reflector is supported so that it can track the sun. The support for this reflector comprises an azimuth frame supported on two wheels and a central pivotal point which are positioned in a substantially triangular configuration. On top of the azimuth frame, there is provided an elevation frame. The reflector rides on wheels captured within curved rails. The wheels of the azimuth frame are driven by an azimuth actuator. The reflector structure is counterbalanced about its elevation axis by a pendulum cable system which is driven by a motor. At the focal point of the parabolic reflector, a heat engine or receiver is mounted independently on the reflector. Suitable means are provided for moving the reflector about its two axes.

Official Gazette of the U.S. Patent and Trademark Office

N79-14527* National Aeronautics and Space Administration, Washington, D. C.

SAFETY FLYWHEEL Patent

Richard T. Schneider, inventor (to NASA) (Univ. of Florida, Gainsville) Issued 2 Jan. 1979 4 p Filed 17 Jan. 1977 Supersedes N77-22484 (15 - 13, p 1729) Sponsored by NASA

(NASA-Case-HQN-10888-1; US-Patent-4,132,130; US-Patent-Appl-SN-760057; US-Patent-Class-74-572; US-Patent-Class-415-9; US-Patent-Class-416-2; US-Patent-Class-303-92; US-Patent-Class-188-151A; US-Patent-Class-188-269) Avail: US Patent and Trademark Office CSCL 10A

An inertial energy storage device is disclosed which uses flywheel made of flexible material such as a twisted rope ring. A small number of the strands of the rope ring have a tensile strength that is lower than that of most of the other strands so that should any of these strands fail, they will begin to whiplash allowing such a failure to be detected and braked before a castastrophic failure occurs. This accomplished by the inclusion of glass tubes located around the periphery of the flywheel. The tubes are in communication with a braking fluid reservoir. The flywheel and glass tubes are enclosed within a vacuum-tight housing. The whiplashing of a broken strand breaks one or more glass tubes. This causes the housing to be flooded with the braking fluid thereby braking the rotation of the flywheel.

Official Gazette of the U.S. Patent and Trademark Office

N79-14528* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

BACK WALL SOLAR CELL Patent

Henry W. Brandhorst, Jr., inventor (to NASA) Issued 26 Dec. 1978 5 p Filed 24 Apr. 1978 Supersedes N78-25556 (16 - 16, p 2137) Continuation-in-part of abandoned US Patent Appl. SN-760771, filed 19 Jan. 1977

(NASA-Case-LEW-12236-2; US-Patent-4,131,486; US-Patent-Appl-SN-899123; US-Patent-Class-136-89SJ; US-Patent-Class-357-30; US-Patent-Appl-SN-760771) Avail: US Patent and Trademark Office CSCL 10A

A solar cell is disclosed which comprises a first semiconductor material of one conductivity type with one face having the same conductivity type but more heavily doped to form a field region arranged to receive the radiant energy to be converted to electrical energy, and a layer of a second semiconductor material, preferably highly doped, of opposite conductivity type on the first semiconductor material adjacent the first semiconductor material at an interface remote from the heavily doped field region. Instead of the opposite conductivity layer, a metallic Schottky diode layer may be used, in which case no additional back contact is needed. A contact such as a gridded contact, previous to the radiant energy may be applied to the heavily doped field region of the more heavily doped, same conductivity material for its contact. Official Gazette of the U.S. Patent and Trademark Office

N79-14529* National Aeronautics and Space Administration. Pasadena Office, Calif.

PRIMARY REFLECTOR FOR SOLAR ENERGY COLLECTION SYSTEMS Patent

Charles G. Miller, inventors (to NASA) (JPL) and James B. Stephens (JPL) Issued 26 Dec. 1978 9 p Filed 15 May 1978 Supersedes N78-25559 (16 - 16, p2138) Division of US Patent Appl. SN-762363, filed 25 Jan. 1977, which is a division of US Patent Appl. SN-598969, filed 24 Jul. 1975, US Patent-4,065,053 Sponsored by NASA

(NASA-Case-NPO-13579-4; US-Patent-4,131,336; US-Patent-Appl-SN-906297; US-Patent-Class-350-292; US-Patent-Class-126-271; US-Patent-Class-350-293; US-Patent-Class-350-320; US-Patent-4,065,053; US-Patent-Appl-SN-762363; US-Patent-Appl-SN-598969) Avail: US Patent and Trademark Office CSCL 10A

A fixed, linear, ground-based primary reflector is disclosed which has an extended curved sawtooth-contoured surface covered with a metalized polymeric reflecting material. The device reflects solar energy to a movably supported collector that is kept at the concentrated line focus of the reflector primary. The primary reflector may be constructed by a process utilizing well-known freeway paving machinery.

Official Gazette of the U.S. Patent and Trademark Office

N79-14530# Office of Technology Assessment, Washington, D. C.

APPLICATION OF SOLAR TECHNOLOGY TO TODAY'S ENERGY NEEDS, VOLUME 2

Sep. 1978 764 p refs

(OTA-E-77-Vol-2; LC-78-600060) Avail: NTIS HC A99/MF A01; HC SOD

Analytical methods are presented for evaluating the economic and technical merits of numerous small-scale solar systems designed to meet the energy requirements of homes, apartment buildings, shopping centers, industries, and small communities. For individual titles, see N79-14531 through N79-14535.

N79-14531# Office of Technology Assessment, Washington, D. C.

ANALYTICAL METHODS

In its App. of Solar Technol. to Today's Energy Needs, Vol. 2 Sep. 1978 p 3-24 refs (For primary document see N79-14530 05-44)

Avail: NTIS HC A99/MF A01; HC SOD

The perceived costs of solar energy depend not only on the perspective which they are examined, but also from the methods used for evaluating them. Basic assumptions are discussed concerning inflation, homeowner financing, rental properties, industries, and utilities. Quantitative methods for assessing financing alternatives are presented. Basic equations are given for determining consumer energy expenses, and the sensitivity of capital charges to consumer's discount rates as well as to the rate of return for the corporate owner are discussed. A.R.H.

N79-14532# Office of Technology Assessment, Washington, D. C.

CURRENT AND PROJECTED FUEL COSTS

In its Appl. of Solar Technol. to Today's Energy Needs, Vol. 2 Sep. 1978 p 27-39 refs (For primary document see N79-14530 05-44)

Avail: NTIS HC A99/MF A01; HC SOD

Residential consumer prices for natural gas, heating oil, and electricity vary significantly in different parts of the country. Future prices will depend on: (1) the cost of developing and producing domestic fuel resources; (2) the price of imported fuels; (3) the cost of producing synthetic fuel substitutes; (4) externalities such as environmental regulations; and (5) explicit and implicit regulatory impact. Confident estimates in these areas simply are not possible, although a large number of the estimates can be supported. The predicted future price of fuel can have a strong influence on both private and public decisions about solar energy. Investments in solar and other conservation equipment will appear more attractive if energy prices are expected to rise sharply instead of remaining constant or increasing gradually. A.R.H.

N79-14533# Office of Technology Assessment, Washington, D. C.

CALCULATION OF BACKUP REQUIREMENTS

In its Appl. of Solar Technol. to Today's Energy Needs, Vol. 2 Sep. 1978 p 43-92 (For primary document see N79-14530 05-44)

Avail: NTIS HC A99/MF A01; HC SOD

A critical question in the operation of a solar energy system is the amount of backup energy required and the pattern of this backup demand. Techniques are provided for approximating the optimum performance of several types of solar cogeneration systems including the optimum operation of possible combinations

of storage equipment. A FORTRAN program was developed to (1) determine the onsite energy demand of the building which includes heating, cooling, hot water, and miscellaneous electrical demands; (2) determine the output of solar collector, and (3) determine the fraction of the onsite energy demand that can be met from solar energy directly or from storage and the fraction that must be supplied from external energy sources (utility electricity, gas, or oil). A.R.H.

N79-14534# Office of Technology Assessment, Washington, D. C.
RESULTS OF SYSTEMS ANALYSIS
In its Appl. of Solar Technol. to Today's Energy Needs, Vol. 2 Sep. 1978 p 95-663 (For primary document see N79-14530 05-44)
Avail: NTIS HC A99/MF A01; HC SOD

A number of integrated solar energy systems designed to meet the energy needs of single family houses, apartment buildings, shopping malls, communities, and industrial plants located in Albuquerque, N. Mex.; Boston, Mass.; Fort Worth, Tex.; and Omaha, Nebr. were analyzed and compared to demonstrate their capability to meet the energy requirements of these buildings and communities. The examples were chosen to indicate the relative attractiveness of a number of different system components, which may become available during the next decade, and indicate the facility with which different combinations of components work together as integrated systems. A summary table indicates the monthly costs for each system analyzed and the effective cost of solar energy generated. The assumptions made in analyzing the performance of each sytem are discussed. A.R.H.

N79-14535# Office of Technology Assessment, Washington, D. C.
A DETAILED ANALYSIS OF THE IMPACT OF ONSITE EQUIPMENT ON UTILITY COSTS
In its Appl. of Solar Technol. to Today's Energy Needs, Vol. 2 Sep. 1978 p 729-752 (For primary document see N79-14530 05-44)
Avail: NTIS HC A99/MF A01; HC SOD

Cases are examined where 1,000 homes equipped with a specific kind of energy equipment are added to the utility grid and cases are examined where 25 percent and 100 percent of the houses in the utility are assumed to be converted to use the system being examined. Two sets of two tables are provided for each of the four cities examined. The first of each pair presents information about the overall impact of the load under examination on utility costs, on the demand for nuclear, coal, and peaking capacity, and on the annual fuel demands of the utility. The second of each pair presents the ratios between the marginal cost of serving loads created by adding solar energy equipment with the marginal costs incurred by changing loads and adding a similar number of buildings served with conventional energy equipment. The first of the two sets for each city presents information assuming that standard utility rates are charged and the second set assumes that consumers purchase energy during offpeak periods to help reduce utility peaks. Details of how these tables were computed are explained. A.R.H.

N79-14536*# Materials Research, Inc., Centerville, Utah.
SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE AREA SILICON SHEET TASK OF THE LOW COST SOLAR ARRAY PROJECT. QUANTITATIVE ANALYSIS OF DEFECTS IN SILICON Quarterly Progress Report, 1 Jun. - 30 Sep. 1978
R. Natesh 1978 52 p refs Prepared for DOE and JPL
(Contracts NAS7-100; JPL-954977)
(NASA-CR-158030; MRI-260; DOE/JPL-954977-78/1; QPR-2) Avail: NTIS HC A04/MF A01 CSCL 10A

The various steps involved in obtaining quantitative information of structural defects in crystalline silicon samples are described. Procedures discussed include: (1) chemical polishing; (2) chemical etching; and (3) automated image analysis of samples on the QTM 720 System. J.M.S.

N79-14537*# SRI International Corp., Menlo Park, Calif.
NOVEL DUPLEX VAPOR ELECTROCHEMICAL METHOD FOR SILICON SOLAR CELLS Quarterly Progress Report, 1 Aug. - 31 Oct. 1978
V. Kapur, K. M. Sancier, A. Sanjurjo, S. Leach, S. Westphal, R. Bartlett, and L. Nanis 1978 55 p refs Prepared for JPL
(Contracts NAS7-100; JPL-954471)
(NASA-CR-158039; ERDA/JPL-954471-77/3; QPR-11) Avail: NTIS HC A04/MF A01 CSCL 10A

Progress in the development of low-cost solar arrays is reported. Topics covered include: (1) development of a simplified feed system for the Na used in the Na-SiF4 reactor; (2) production of high purity silicon through the reduction of sodium fluosilicate with sodium metal; (3) the leaching process for recovering silicon from the reaction products of the SiF4-Na reaction; and (4) silicon separation by the melting of the reaction product. J.M.S.

N79-14538*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CATALYST SURFACES FOR THE CHROMOUS/CHROMIC REDOX COUPLE Patent Application
Jose D. Giner (Giner, Inc., Waltham, Mass.) and Kathleen J. Cahill, inventors (to NASA) (Giner, Inc., Waltham, Mass.) Filed 29 Nov. 1978 13 p Sponsored by NASA
(NASA-Case-LEW-13148-1; US-Patent-Appl-SN-964754) Avail: NTIS HC A02/MF A01 CSCL 10A

An electricity-producing cell of the reduction-oxidation (REDOX) type is presented. The cell comprises a container divided into anode and cathode compartments by an ion permeable membrane. The novelty of the invention appears to lie in the provision of selected catalytic coatings with lead on the anode electrode of a REDOX cell to greatly increase current density. NASA

N79-14539# Alabama Univ., Huntsville. Environmental and Energy Center.
SOLAR RADIATION DATA SOURCES, APPLICATIONS AND NETWORK DESIGN
Eugene A. Carter, David L. Christensen, and Baker B. Williams Apr. 1978 202 p refs
(Contract EG-77-S-05-5362)
(HCP/T5362-01) Avail: NTIS HC A10/MF A01

A prerequisite to considering solar energy projects is to determine the requirements for information about solar radiation to apply to possible projects. This report offers techniques to help the reader specify requirements in terms of solar radiation data and information currently available, describes the past and present programs to record and present information to be used for most requirements, presents courses of action to help the user meet his needs for information, lists sources of solar radiation data and presents the problems, costs, benefits and responsibilities of programs to acquire additional solar radiation data. Author

N79-14540*# Crystal Systems, Inc., Salem, Mass.
SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE AREA SHEET TASK OF THE LOW COST SOLAR ARRAY PROJECT. HEAT EXCHANGER METHOD - INGOT CASTING FIXED ABRASIVE METHOD - MULTI-WIRE SLICING Quarterly Progress Report, 1 Jul. 1978 - 30 Sep. 1978
Frederick Schmid and Chandra P. Khattak 15 Oct. 1978 67 p refs Prepared for DOE and JPL
(Contract NAS7-100; JPL-954373)
(NASA-CR-158038; QPR-4; DOE/JPL-954373-78/7; DRL-58-DRD-SE-7) Avail: NTIS HC A04/MF A01 CSCL 10A

Solar cells fabricated from HEM cast silicon yielded up to 15% conversion efficiencies. This was achieved in spite of using unpurified graphite parts in the HEM furnace and without optimization of material or cell processing parameters. Molybdenum retainers prevented SiC formation and reduced carbon content by 50%. The oxygen content of vacuum cast HEM silicon is lower than typical Czochralski grown silicon. Impregnation of 45 micrometers diamonds into 7.5 micrometers copper sheath showed distortion of the copper layer. However, 12.5 micrometers and 15 micrometers copper sheath can be impregnated with 45 micrometers diamonds to a high concentration. Electroless nickel plating of wires impregnated only in the cutting edge showed nickel concentration around the diamonds. This has the possibility of reducing kerf. The high speed slicer fabricated can achieve higher speed and longer stroke with vibration isolation. Author

N79-14541*# Lamar Univ., Beaumont, Tex. Dept. of Chemical Engineering.

PROCESS FEASIBILITY STUDY IN SUPPORT OF SILICON MATERIAL TASK 1 Quarterly Technical Progress Report, Sep. 1978 - Dec. 1978

Ku-Yen Li, Keith C. Hansen, and Carl L. Yaws Dec. 1978 69 p refs Prepared for DOE and JPL

(Contract JPL-954343)

(NASA-CR-158034; ERDA/JPL-954343-78/13; QTPR-13) Avail: NTIS HC A04/MF A01 CSCL 10A

Process system properties are analyzed for materials involved in the alternate processes under consideration for solar cell grade silicon. The following property data are reported for trichlorosilane: critical constants, vapor pressure, heat of vaporization, gas heat capacity, liquid heat capacity, density, surface tension, viscosity, thermal conductivity, heat of formation, and Gibb's free energy of formation. Work continued on the measurement of gas viscosity values of silicon source materials. Gas phase viscosity values for silicon tetrafluoride between 40 C and 200 C were experimentally determined. Major efforts were expended on completion of the preliminary economic analysis of the silane process. Cost, sensitivity and profitability analysis results are presented based on a preliminary process design of a plant to produce 1,000 metric tons/year of silicon by the revised process. G.G.

N79-14542*# Westinghouse Electric Corp., Trafford, Pa. Power Circuit Breaker Div.

LOW COST SOLAR ARRAY PROJECT SILICON MATERIALS TASK. DEVELOPMENT OF A PROCESS FOR HIGH CAPACITY ARC HEATER PRODUCTION OF SILICON FOR SOLAR ARRAYS Quarterly Technical Report, Jul. 1978 - Sep. 1978

William H. Reed 1978 91 p refs Prepared for DOE and JPL

(Contract JPL-954589)

(NASA-CR-158036; DOE/JPL-954589-78/7) Avail: NTIS HC A05/MF A01 CSCL 10A

Silicon tetrachloride and a reductant (sodium) will be injected into an arc heated mixture of hydrogen and argon, yielding silicon and gaseous sodium chloride. Detailed characterization of the Sonicore sodium injection nozzle, using water as the test fluid was completed. Results indicated that flow rates of 45 gph sodium and 50 scfm argon should produce sufficiently small droplet sizes. The design effort was also completed for the test system preparation which was divided into two categories: (1) system components and (2) test system-laboratory integration. J.A.M.

N79-14543*# Spire Corp., Bedford, Mass.

INTEGRAL GLASS ENCAPSULATION FOR SOLAR ARRAYS Quarterly Progress Report

Dec. 1978 23 p Sponsored by NASA Prepared for JPL

(Contract JPL-954521)

(NASA-CR-158033; QPR-9; DOE/JPL-954521-78/4) Avail: NTIS HC A03/MF A01 CSCL 10A

The status of development of the techniques for employing electrostatic bonding in conjunction with terrestrial solar cells is presented. G.Y.

N79-14544*# Rockwell International Corp., Anaheim, Calif. Electronic Devices Div.

CHEMICAL VAPOR DEPOSITION GROWTH Final Report, 29 Dec. 1975 - 31 Aug. 1977

R. P. Ruth, H. M. Manasevit, A. G. Campbell, R. E. Johnson, J. L. Kenty, L. A. Moudy, G. L. Shaw, W. I. Simpson, and J. J. Yang Oct. 1978 249 p Prepared for DOE and JPL

(Contract JPL-954372)

(NASA-CR-158031; DOE/JPL-954372-78/6; C76-320/501) Avail: NTIS HC A11/MF A01 CSCL 10A

The objective was to investigate and develop chemical vapor deposition (CVD) techniques for the growth of large areas of Si sheet on inexpensive substrate materials, with resulting sheet properties suitable for fabricating solar cells that would meet the technical goals of the Low Cost Silicon Solar Array Project. The program involved six main technical tasks: (1) modification and test of an existing vertical-chamber CVD reactor system; (2) identification and/or development of suitable inexpensive substrate materials; (3) experimental investigation of CVD process parameters using various candidate substrate materials; (4) preparation of Si sheet samples for various special studies, including solar cell fabrication; (5) evaluation of the properties of the Si sheet material produced by the CVD process; and (6) fabrication and evaluation of experimental solar cell structures, using impurity diffusion and other standard and near-standard processing techniques supplemented late in the program by the in situ CVD growth of n(+)/p/p(+) sheet structures subsequently processed into experimental cells. Author

N79-14545*# Optical Coating Lab., Inc., City of Industry, Calif. Photoelectronics Div.

SILICON SOLAR CELL PROCESS. DEVELOPMENT, FABRICATION AND ANALYSIS Quarterly Report, 15 Jun. 1978 - 30 Sep. 1978

H. I. Yoo, P. A. Iles, and D. P. Tanner 30 Sep. 1978 117 p refs Sponsored by DOE and JPL

(Contract JPL-955089)

(NASA-CR-158035; DOE/JPL-955089-78/10; QR-1) Avail: NTIS HC A06/MF A01 CSCL 10A

Solar cells were fabricated from unconventional silicon sheets, and the performances were characterized with an emphasis on statistical evaluation. A number of solar cell fabrication processes were used and conversion efficiency was measured under AMO condition at 25 C. Silso solar cells using standard processing showed an average efficiency of about 9.6%. Solar cells with back surface field process showed about the same efficiency as the cells from standard process. Solar cells from grain boundary passivation process did not show any improvements in solar cell performance. Author

N79-14546*# Lockheed Missiles and Space Co., Palo Alto, Calif.

CONCENTRATOR ENHANCED SOLAR ARRAYS DESIGN STUDY Final Report

D. R. Lott Oct. 1978 114 p Prepared for JPL

(Contracts NAS7-100; JPL-955110)

(NASA-CR-158032; LMSC-D665407) Avail: NTIS HC A06/MF A01 CSCL 10A

The analysis and preliminary design of a 25 kW concentrator enhanced lightweight flexible solar array are presented. The study was organized into five major tasks: (1) assessment and specification of design requirements; (2) mechanical design; (3) electric design; (4) concentrator design; and (5) cost projection. The tasks were conducted in an iterative manner so as to best derive a baseline design selection. The objectives of the study are discussed and comparative configurations and mass data on the SEP (Solar Electric Propulsion) array design, concentrator design options and configuration/mass data on the selected concentrator enhanced solar array baseline design are presented. Design requirements supporting design analysis and detailed baseline design data are discussed. The results of the cost projection analysis and new technology are also discussed. G.Y.

N79-14547*# Motorola, Inc., Phoenix, Ariz. Semiconductor Group.

LASER-ZONE GROWTH IN A RIBBON-TO-RIBBON (RTR) PROCESS. SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE AREA SHEET TASK OF THE LOW-COST SOLAR ARRAY PROJECT Annual Report

A. Baghdadi, R. W. Gurtler, R. Legge, B. Sopori, and R. J. Ellis 30 Sep. 1978 85 p Sponsored by DOE and JPL

(Contract JPL-954376; Proj. 2319-2325)

(NASA-CR-158045; DOE/JPL-954376-78/4; Rept-2256/11) Avail: NTIS HC A05/MF A01 CSCL 10A

A new calculation of the effects of thermal stresses during growth on silicon ribbon quality is reported. Thermal stress distributions are computed for ribbon growth under a variety of temperature profiles. A growth rate of 55 cu cm/min with a single ribbon was achieved. The growth of RTR ribbon with a fairly uniform parallel dendritic structure was demonstrated. Results with two approaches were obtained for reducing the Mo impurity level in polycrystalline feedstock. Coating the Mo substrate with Si3N4 does not effect thermal shear separation of the polyribbon; this process shows promise of improving cell efficiency and also increasing the useful life of the molybdenum

substrate. A number of solar cells were fabricated on RTR silicon grown from CVD feedstock. G.Y.

N79-14548*# Solarex Corp., Rockville, Md.
PILOT LINE REPORT: DEVELOPMENT OF A HIGH EFFICIENCY THIN SILICON SOLAR CELL
Nov. 1978 65 p Prepared for JPL
(Contract NAS7-100; JPL-954883)
(NASA-CR-158028; SX/115/PL) Avail: NTIS HC A04/MF A01 CSCL 10A

Experimental technology advances were implemented to increase the conversion efficiency of ultrathin 2cm x 2cm cells, to demonstrate a capability for fabricating such cells at a rate of 10,000 per month, and to fabricate 200 large-area ultrathin cells to determine their feasibility of manufacture. A production rate of 10,000 50 micron m cells per month with lot average AM0 efficiencies of 11.5% was demonstrated, with peak efficiencies of 13.5% obtained. Losses in most stages of the processing were minimized, the remaining exceptions being in the photolithography and metallization steps for front contact generation and breakage handling. The 5cm x 5cm cells were fabricated with a peak yield in excess of 40% for over 10% AM0 efficiency. Greater fabrication volume is needed to fully evaluate the expected yield and efficiency levels for large cells. A.R.H.

N79-14549*# Eagle-Picher Co., Miami, Okla.
STUDY PROGRAM TO DEVELOP AND EVALUATE DIE AND CONTAINER MATERIALS FOR THE GROWTH OF SILICON RIBBONS Quarterly Report
Oct. 1978 86 p refs Prepared for DOE and JPL
(Contract JPL-954877)
(NASA-CR-158040; DOE/JPL-954877-78/3; QR-4) Avail: NTIS HC A05/MF A01 CSCL 10A

Initial sessile drop experiments on SiC, Si3N4 and A1N were conducted. Very promising results were achieved on both SiC and Si3N4 where minimal penetration of these CNTD coatings by molten silicon was observed. More detailed characterization of the CNTD microstructures was accomplished as well as X-ray characterization of the third and fourth candidate materials system sets (i.e. A1N and altered Si3N4). Polished sections of post sessile drop specimens were also prepared and evaluated. The techniques of full scale crucible hot pressing were developed and die grinding development was initiated. The apparatus for measurement of oxygen partial pressure was reconstructed and calibrated. The sessile drop temperature measurement procedure was calibrated for absorption by the pyrex view-port and additional Auger electron analysis was performed at the interface of molten silicon with CNTD Si3N4 and A1N. G.Y.

N79-14550*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
EFG SOLAR MODULES Final Report, 31 Mar. - 31 Aug. 1978
13 Sep. 1978 31 p refs Prepared for DOE and JPL
(Contract JPL-954999)
(NASA-CR-158029; DOE/JPL-954999-78/1) Avail: NTIS HC A03/MF A01 CSCL 10A

Six photovoltaic modules using solar cells fabricated from silicon ribbons were assembled and delivered to JPL. Each module was comprised of four separate submodules which were parallel connected. The submodules contained 45 EFG cells which were series interconnected by a shingle or overlapping design. The inherent rectangular shape of the cells allowed a high packing factor to be achieved. The average efficiency of the six modules, corrected to AM1 at 28 C was 8.7%, which indicates that the average encapsulated cell efficiency was 10.0%. Author

N79-14551*# General Electric Co., Philadelphia, Pa. Space Div.
CONCEPTUAL APPROACH STUDY 200 WATT PER KILOGRAM SOLAR ARRAY, PHASE 3 Final Report
G. J. Rayl 30 Oct. 1978 51 p Prepared for JPL
(Contracts NAS7-100; JPL-954393)
(NASA-CR-158046; DOC-78SDS4257) Avail: NTIS HC A04/MF A01 CSCL 10A

Activities are described that were directed by JPL to support the earlier conceptual design work with proof of concept models on the one hand, and laboratory test and evaluation of alternate designs and materials that hold promise for further mass economies, on the other. In support of this advanced solar blanket technology the following work was accomplished: (1) preparation of an 80 cell solar module for a 1000 cycle thermal test (2) fabrication of a 660 cell solar panel and performance evaluation of this article after a '0' g flight test, (3) design improvement of the cell interconnect for further mass reduction, (4) completion of UV exposure and thermal cycle tests for a variety of cell cover material and adhesives and (5) preparation of a quantity of representative solar array test specimens for space flight on NASA's Long Duration Exposure Facility (LDEF). Author

N79-14552*# Sensor Technology, Inc., Chatsworth, Calif.
ARRAY AUTOMATED ASSEMBLY TASK, PHASE 2. LOW COST SILICON SOLAR ARRAY PROJECT Quarterly Technical Report, Jul. - Sep. 1978
Sang S. Rhee, Gregory T. Jones, and Kimberly T. Allison 30 Sep. 1978 59 p Prepared for DOE and JPL
(Contract JPL-954865)
(NASA-CR-158044; DOE/JPL-954865-78/4; QTR-4) Avail: NTIS HC A04/MF A01 CSCL 10A

Several modifications instituted in the wafer surface preparation process served to significantly reduce the process cost to 1.55 cents per peak watt in 1975 cents. Performance verification tests of a laser scanning system showed a limited capability to detect hidden cracks or defects, but with potential equipment modifications this cost effective system could be rendered suitable for applications. Installation of electroless nickel plating system was completed along with an optimization of the wafer plating process. The solder coating and flux removal process verification test was completed. An optimum temperature range of 500-550 C was found to produce uniform solder coating with the restriction that a modified dipping procedure is utilized. Finally, the construction of the spray-on dopant equipment was completed. L.S.

N79-14553*# RCA Labs., Princeton, N. J.
DEVELOPMENT AND EVALUATION OF DIE MATERIALS FOR USE IN THE GROWTH OF SILICON RIBBONS BY THE INVERTED RIBBON GROWTH PROCESS, TASK 2. LSSA PROJECT Quarterly Report, 1 Jul. - 30 Sep. 1978
M. T. Duffy, S. Berkman, H. S. Moss, and G. W. Cullen Sep. 1978 19 p Prepared for DOE and JPL
(Contracts NAS7-100; JPL-954901)
(NASA-CR-158043; DOE/JPL-954901-78/4; QR-4) Avail: NTIS HC A02/MF A01 CSCL 10A

The results of emission spectroscopic analysis indicate that molten silicon can remain in contact with hot-pressed Si3N4 (99.2 percent theoretical density) for prolonged periods without attaining the impurity content level of the nitride. Although MgO was used as binder, Mg was not found present in the silicon sessile drop in quantities much above the level initially present in the silicon source material. Preliminary experiments with EFG-type dies coated with CVD Si3N4 or CVD SiOxNy indicate that capillary rise does not occur readily in these dies. The same was found to be true of hot-pressed and reaction-sintered Si3N4 obtained commercially. However, when dies were formed by depositing CVD layers on shaped silicon slabs, a column of molten silicon was maintained in each CVD die while being heated in contact with a crucible of molten silicon. Preliminary wetting of dies appears necessary for EFG growth. Several ribbon growth experiments were performed from V-shaped dies. Author

N79-14554*# Texas Instruments, Inc., Dallas.
LSSA LARGE AREA SILICON SHEET TASK CONTINUOUS CZOCHRALSKI PROCESS DEVELOPMENT Annual Report, Oct. 1977 - Sep. 1978
Samuel N. Rea Oct. 1978 53 p refs Prepared for DOE and JPL
(Contract JPL-954887)
(NASA-CR-158042; TI-03-78-46; DOE/JPL-954887-78/4) Avail: NTIS HC A04/MF A01 CSCL 10A

A Czochralski crystal growing furnace was converted to a continuous growth facility by installation of a premelter to provide molten silicon flow into the primary crucible. The basic furnace is operational and several trial crystals were grown in the batch mode. Numerous premelter configurations were tested both in

laboratory-scale equipment as well as in the actual furnace. The best arrangement tested to date is a vertical, cylindrical graphite heater containing small fused silicon test tube liner in which the incoming silicon is melted and flows into the primary crucible. Economic modeling of the continuous Czochralski process indicates that for 10 cm diameter crystal, 100 kg furnace runs of four or five crystals each are near-optimal. Costs tend to asymptote at the 100 kg level so little additional cost improvement occurs at larger runs. For these conditions, crystal cost in equivalent wafer area of around $20/sq m exclusive of polysilicon and slicing was obtained. G.G.

N79-14555*# AeroChem Research Labs., Inc., Princeton, N. J.
DEVELOPMENT OF A MODEL AND COMPUTER CODE TO DESCRIBE SOLAR GRADE SILICON PRODUCTION PROCESSES Quarterly Report
R. K. Gould Nov. 1978 13 p refs Sponsored by NASA Prepared for JPL
(Contract JPL-954862)
(NASA-CR-15803; AeroChem-TN-200; DOE/JPL-954862-78/4; QR-4) Avail: NTIS HC A02/MF A01 CSCL 10A

Mechanisms for the SiCl4/Na and SiF4/Na reaction systems were examined. Reaction schemes which include 25 elementary reactions were formulated for each system and run to test the sensitivity of the computed concentration and temperature profiles to the values given estimated rate coefficients. It was found that, for SiCl4/Na, the rate of production of free Si is largely mixing-limited for reasonable rate coefficient estimates. For the SiF4/Na system the results indicate that the endothermicities of many of the reactions involved in producing Si from SiF4/Na cause this system to be chemistry-limited rather than mixing-limited. Author

N79-14556*# Solar Engineering and Mfg. Co., Deerfield Beach, Fla.
DESIGN AND INSTALLATION PACKAGE FOR SOLAR HOT WATER SYSTEM
Dec. 1978 32 p Prepared for DOE
(Contract NAS8-32248)
(NASA-CR-150859) Avail: NTIS HC A03/MF A01 CSCL 10A

Included are the system performance specifications, system design drawings, hazard analysis and other information necessary to evaluate the design and install the system. L.S.

N79-14557*# Honeywell, Inc., Minneapolis, Minn.
PRELIMINARY DESIGN PACKAGE FOR PROTOTYPE SOLAR HEATING SYSTEM
Dec. 1978 113 p Prepared for DOE
(Contract NAS8-32093)
(NASA-CR-150858) Avail: NTIS HC A06/MF A01 CSCL 10A

A summary is given of the preliminary analysis and design activity on solar heating systems. The analysis was made without site specific data other than weather; therefore, the results indicate performance expected under these special conditions. Major items include system candidates, design approaches, trade studies and other special data required to evaluate the preliminary analysis and design. The program calls for the development and delivery of eight prototype solar heating and cooling systems for installation and operational test. L.S.

N79-14558# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
A STATE OF CHARGE MONITOR FOR SEALED LEAD-ACID CELLS
A. H. Zimmerman, M. R. Martinelli, and C. C. Badcock 20 Jul. 1978 42 p refs
(ATR-78(8114)-2) Avail: NTIS HC A03/MF A02

Instrumentation for monitoring the state of charge of sealed lead-acid cells during discharge was designed. This monitor utilizes the cell voltage during discharge, compensating for variations in load current and temperature. The discharge voltage is converted to a linear function of state of charge by a nonlinear amplifier. Statistics are given for the uncertainty in the monitor. S.E.S.

N79-14559# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE APPLICATION OF OPTIMAL CONTROL THEORY HYBRID ELECTRIC TRANSIT SYSTEMS M.S. Thesis
Michael J. Keane Oct. 1977 137 p refs
(AD-A059365; AFIT-CI-78-113) Avail: NTIS HC A07/MF A01 CSCL 13/6

In an effort to minimize energy losses through the optimal control of an electric rapid transit system, three vehicle/flywheel configurations are modeled using the bond graph technique. Field and armature control of an on-board flywheel are presented along with field control of a station flywheel used in conjunction with a typical regenerative vehicle. Pontryagin's Minimum Principle is used to develop the optimal control trajectories for vehicle accelerations and decelerations. The time integral of mechanical and electrical losses is minimized as the cost function. Armature control of the hybrid vehicle and field control of the station flywheel are equally efficient in the reversible energy flow between vehicle and flywheel. Field control of the hybrid vehicle is slightly less efficient. The optimal trajectory for deceleration is nearly linear, but the optimal trajectory for acceleration, due to the effect of mechanical losses over a longer time period, is highly concave and differs radically from a typical transit acceleration. The vehicle weight and resistance in the armature windings have a large influence on system performance. Author (GRA)

N79-14560# Lockheed Missiles and Space Co., Palo Alto, Calif.
OBSERVATIONS OF AN OPERATING ZINC-PORE ELECTRODE Interim Technical Report
Theodore Katan, J. R. Savory, and J. Perkins 7 Sep. 1978 35 p refs
(Contract N00014-73-C-0397)
(AD-A059300; LMSC-D630102; TR-7) Avail: NTIS HC A03/MF A01 CSCL 10/3

A single pore cell with a 14 micron spacing is used as an analog of a porous zinc anode and cathode for examinations of surface morphology and reaction profile in 10 M KOH, saturated ZnO. At the anode the dissolution-precipitation mode of ZnO formation is corroborated and the effective depth of reaction penetration is initially 0.09 cm. Structure of the deposited ZnO film is determined by SEM to be porous with 80 percent porosity. At the cathode, H2 bubbles are found to be related to the initiation and growth of zinc dendrites. Author (GRA)

N79-14561# Eagle-Picher Co., Joplin, Mo. Couples Dept.
NICKEL-ZINC BATTERY FOR AIRCRAFT AND MISSILE APPLICATIONS Final Report, 14 Feb. 1975 - 14 Feb. 1978
Robert A. Brown Apr. 1978 146 p refs
(Contract F33615-75-C-2004)
(AD-A059295; AFAPL-TR-78-16) Avail: NTIS HC A07/MF A01 CSCL 10/3

For aircraft applications, a nickel-zinc battery has been developed which exhibits an improvement in low temperature/high rate performance as compared to the standard nickel-cadmium aircraft battery (MS-24497-5). The nickel-zinc battery is the same size and weight as the nickel-cadmium battery, but is rated at 45 AH capacity vs. 22 AH for the nickel-cadmium. Cycle life of 200 cycles (20 amperes for 1 hour) have been demonstrated in a configuration capable of delivering 1000 ampere discharge at -20 F. Nickel-zinc batteries were also manufactured for remotely piloted vehicle (RPV) applications to compare to existing lead-acid and silver-zinc batteries. These vehicles require a limited number of cycles at a high energy density and are a logical application of the nickel-zinc system. For missile applications, a remotely activated nickel-zinc battery has been developed to compare to the standard remotely activated silver-zinc battery. Reductions in the amount of separator needed for wet stand capability allow the nickel-zinc battery to exhibit higher capacity than the silver-zinc battery at room temperature discharge. Author (GRA)

N79-14562# Naval Ship Research and Development Center, Annapolis, Md. Propulsion and Auxiliary Systems Dept.
A METHOD FOR PREDICTING THE OFF-DESIGN PERFORMANCE OF CLOSED-BRAYTON-CYCLE ENGINES
Donald T. Knauss Sep. 1978 38 p refs
(SF43432301)
(AD-A060008; DTNSRDC-PAS-77-42) Avail: NTIS

HC A03/MF A01 CSCL 13/10

The development of a computer program for predicting the off-design performance of closed-Brayton-cycle engines is discussed. The approach to the problem was to modify an existing Navy-developed open-cycle gas turbine engine program. The characteristics of the existing program and the various techniques used in closing the cycle are discussed, along with modification of the existing program subroutines and the development of new program controls. The requirements for modeling the component performance and the mechanical losses associated with a laboratory engine under test are considered. Engine off-design performance predictions obtained by the above method are compared with those of the engine manufacturer. Further comparisons are made between the computed results and those obtained from actual engine test data. Some estimates of the errors associated with the engine data-acquisition system are presented. A discussion of multi-parameter performance mapping is included, and the basis procedure used in developing a four-parameter map of the closed-Brayton-cycle laboratory engine is described. The map obtained by this method is presented and discussed. Author (GRA)

N79-14563# Naval Avionics Facility, Indianapolis, Ind.
POWER DISTRIBUTION GUIDELINES
Thomas R. Aldridge Jul. 1978 38 p refs
(AD-A059127; NAC-TR-2212) Avail: NTIS HC A03/MF A01 CSCL 10/2

The establishment of quantitative guidelines for and the modeling of power distribution systems for SEM configured equipments is discussed. Math models of critical power distribution parameters and empirical line parameter formulae are given, with appendices providing the appropriate derivations and references. GRA

N79-14564# Oak Ridge National Lab., Tenn. Div. of Coal Conversion and Utilization.
FLUIDIZED BED GAS TURBINE EXPERIMENTAL UNIT FOR MIUS APPLICATIONS Quarterly Progress Report, 1 Jul. - 30 Sep. 1975
A. P. Fraas Nov. 1977 23 p refs
(Contracts E(49-18)-1742; HUD-H-40-72)
(ORNL/HUD/MIUS-32) Avail: NTIS HC A02/MF A01

The conceptual design of an experimental coal fired closed cycle gas turbine having an electrical output of approximately 325 kW(e) is described. Application to modular integrated utility systems is considered. DOE

N79-14565# Mitre Corp., McLean, Va.
LEAD-ACID BATTERY: AN EVALUATION OF COMMERCIALIZATION STRATEGIES
Floyd Davis, Ralph Kuchnel, Jerry Price, and Geoffrey Smith Nov. 1977 268 p refs
(Contract EC-77-C-01-5025)
(MTR-7593) Avail: NTIS HC A12/MF A01

The lead-acid battery energy storage for electric utility peaking applications in the near term is explored. A review of existing literature and interviews with selected electric utilities are used to identify key parameters for market acceptance. Analytical techniques are developed to quantify these parameters and estimates of regional and national market size are made. Possible government actions are identified and qualitative criteria and measurements of cost effectiveness are developed. DOE

N79-14566# Sandia Labs., Albuquerque, N. Mex. Systems Analysis Dept.
PRELIMINARY ECONOMIC ANALYSIS OF SOLAR IRRIGATION SYSTEMS (SIS) FOR SELECTED LOCATIONS
Laurance L. Lukens, Audrey M. Perino, and Sharla G. Vandevender Nov. 1977 53 p refs Sponsored by DOE
(SAND-77-1403) Avail: NTIS HC A04/MF A01

The economic feasibility of stand-alone solar irrigation systems is considered for certain locations by comparing the life cycle cost (LCC) of the solar system to the LCC of conventional systems. The results show that economic feasibility is dependent on utilization of the SIS for production of energy in addition to that required to water crops. In Southern Arizona, the LCC of the SIS, when used only to pump water, ranges from 3 to 1.7 times that of a conventional electric system for start-up dates of 1980 and 1990. For the same system, the LCC ratio ranges from 1.6 to 0.9 when 100% utilization of the system capacity is achieved. The feasibility of a hybrid system was also examined for Arizona. This system purchased 21% of the required power, yet the hybrid LCC was only 0% of that of a conventional electric system with a 1990 start-up date. DOE

N79-14567# Sandia Labs., Albuquerque, N. Mex. Advanced Energy Project Div.
LIGHTNING PROTECTION FOR THE VERTICAL AXIS WIND TURBINE
Curtis W. Dodd Oct. 1977 26 p refs Sponsored by DOE
(SAND-77-1241) Avail: NTIS HC A03/MF A01

The results are reported of lightning protection studies for Vertical Axis Wind Turbines. The methodology is established for determining the chances for a lightning strike at a VAWT site. Proposed designs for lightning protector, systems are described. These designs include an insulator design, a brush by-pass design, a cone of protecting, lightning climination device, and a concentric tower protection system. The work also describes an effective grounding system. DOE

N79-14568# Sandia Labs., Albuquerque, N. Mex. Facilities/Test Equipment Design and Development Div.
SOLAR THERMAL TEST FACILITY EXPERIMENT MANUAL
David M. Darsey, John T. Holmes, Larry O. Seamons, Dean J. Kuehl, David B. Davis, John M. Stomp, Larry K. Matthews, and John V. Otts Oct. 1977 49 p Sponsored by DOE
(SAND-77-1173) Avail: NTIS HC A03/MF A01

The Solar Thermal Test Facility (STFF) is operated to advance the development of solar thermal electric power to a commerical scale. The STFF with a thermal collection capability of about 5 megawatts is designed to perform a variety of functions. Information on administrative procedures, the capabilities of the STFF, and the requirements of the experimenter is given. DOE

N79-14569# Edgerton, Germeshausen and Grier, Inc., Albuquerque, N.Mex.
PERFORMANCE TESTING OF THE HEXCEL PARABOLIC TROUGH SOLAR COLLECTOR
Vernon E. Dudley and Robert M. Workhoven (Sandia Labs., Albuquerque) Mar. 1978 24 p refs Sponsored by DOE
(SAND-76-0381) Avail: NTIS HC A02/MF A01

The testing is summarized which was performed on the Hexcel Parabolic Trough Solar Collector at the Solar Total Energy Test Facility. Test objectives are defined, test procedures are described, and results and conclusions are given. DOE

N79-14570# Sandia Labs., Livermore, Calif.
THERMOCHEMICAL ENERGY STORAGE AND TRANSPORT PROGRAM Semiannual Report, Apr. - Sep. 1977
T. Tazwell Bramlette, comp. and Raymond W. Mar, comp. Mar. 1978 113 p
(SAND-78-8056) Avail: NTIS HC A06/MF A01

A state-of-the-art assessment, project goals, and project accomplishments are presented. Project activities described include chemical energy storage, solar energy storage, open and closed loop energy storage systems, chemical heat pumps, and several generic research projects. DOE

N79-14571# Sandia Labs., Albuquerque, N. Mex.
RECOMMENDATIONS FOR THE CONCEPTUAL DESIGN OF THE BARSTOW, CALIFORNIA, SOLAR CENTRAL RECEIVER PILOT PLANT: EXECUTIVE SUMMARY
Oct. 1977 34 p
(SAND-77-8035) Avail: NTIS HC A03/MF A01

Recommended subsystem designs that should be incorporated into the 10 MWe pilot plant to be built at Barstow, California are presented. A summary of technical information used in making the selections is included. These recommendations are relative to the design concept only; they are not intended to represent a rating of the contractors. DOE

N79-14572# Sandia Labs., Albuquerque, N. Mex.
A STUDY OF SOME PARAMETERS AFFECTING THE PERFORMANCE OF Ca/CaCrO4
Samuel C. Levy 1978 13 p refs Sponsored by DOE
(SAND-77-1526C; Conf-780624-1) Avail: NTIS

HC A02/MF A01

The Ca/LiCl-DCl-SiO2/CaCr04-Fe thermal battery was used for many ordnance applications. The current design made use of pellets--the CaCr04 depolarizer (D), LiCl-KCl electrolyte (E), and SiO2 binder (B) were blended and pressed into a DEB pellet; a cell was formed by placing such a pellet between a Ca anode and Fe cathode. Cells were then stacked to form a battery. The cell stack was placed in a container and squeezed under a closing force; a header was then welded to the container to form a hermetically sealed battery. DOE

N79-14573# International Business Machines Corp., Huntsville, Ala.

INSTRUMENTATION INSTALLATION GUIDELINES

1 Nov. 1977 102 p refs

(SOLAR/0001-77/15) Avail: NTIS HC A06/MF A01

The various activities which must be performed in instrumenting solar systems for evaluation of their performance are identified and described. In addition, the responsibilities of ERDA, or ERDA's contractors, and the site contractor in the definition and installation of required instrumentation for monitoring solar energy systems are defined. DOE

N79-14574# Blalock (S. D., Jr.), Kingsport, Tenn.

USE OF WASTE HEAT FROM THERMAL ELECTRIC POWER PLANTS AND NUCLEAR POWER PLANTS TO HEAT GREENHOUSES

R. Minasyan, I. Korolev, and G. Ageyen 1977 11 p Transl. into ENGLISH from the Joint Soviet-Amer. Coord. Comm. on theme 08.0203 (Moscow), 1977 p. 1-17

(ORNL-TR-4483) Avail: NTIS HC A02/MF A01

Main technical and economical premises are presented concerning utilization of nuclear and steam power plant waste heat for heating of greenhouses. Heating systems developed for such greenhouses are described. Principles are given of heat engineering design for heating of greenhouses by nuclear and steam power plant waste heat. DOE

N79-14575# Oak Ridge National Lab., Tenn.

FLUIDIZED BED GAS TURBINE EXPERIMENTAL UNIT FOR MIUS APPLICATIONS Quarterly Progress Report, 1 Oct. - 31 Dec. 1975

A. P. Fraas Nov. 1977 23 p refs

(Contract E(49-18)-1742)

(ORNL/HUD/MIUS-33) Avail: NTIS HC A02/MF A01

Discussions with vendors are proceeding based on the Phase 1 layout drawings. Several modifications were made in detailed elements of the furnace design to simplify fabrication. A study contract was arranged and the problems involved in adapting an engine to operate with a fluidized bed heat source are being examined. Cold flow tests to investigate the rate of dispersion of coal injected into the 4 ft square bed through the coal feed ports were started. The Iron Fireman stroker was installed and bench tests were initiated. DOE

N79-14576# Federal Energy Administration, Washington, D. C. National Energy Information Center.

ENERGY INFORMATION: REPORT TO CONGRESS Quarterly Report, first quarter, 1977

C. R. Pelto, ed. 1977 118 p

(NTISUB/C/027-001; FEA/B-77/181; QR-1) Avail: NTIS HC A06/MF A01 CSCL 10A

Data are compiled on energy sources in the United States. Gains in total resource developments are discussed. Data on production, consumption, stocks, imports, exports, transportation, and reserves of coal are summarized. Data on natural gas and NGL are provided followed by data on supply and demand, production, imports, exports, refinery activities, inventories, allocations, and reserves for petroleum. Information on the status of domestic nuclear power plants, operating plants, construction, capacity projections and requirements, supply of nuclear fuels, materials, and policy decisions are included. Electricity consumption, imports and exports, production, primary energy consumed and stockpiled by power plants and power plant conversion efficiency are presented. Data on hydropower are tabulated. DOE

N79-14577# Boeing Aerospace Co., Seattle, Wash.

IMPROVED SEMICONDUCTORS FOR PHOTOVOLTAIC SOLAR CELLS Quarterly Progress Report, 18 Sep. - 18 Dec. 1976

R. A. Mickelsen and W. S. Chen Oct. 1977 27 p refs

(DSE/2459-2; QPR-2) Avail: NTIS HC A03/MF A01

Copper indium selenide was investigated as a potential semiconductor material for low cost, mass produced thin film photovoltaic solar cells. Techniques for producing single phase CuInSe2 films deposited by vacuum evaporation from three independent vapor sources (Cu,In, and Se) were developed. Achievement of single phase chalcopyrite CuInSe2 is reported by utilizing postdeposition baking in an Se environment at 500 C and in high vacuum at 350 C to 400 C. Electrical properties of the deposited P-type films are presented which show a strong dependence on film composition. Copper rich films are reported to be of low resistivity, low hole mobility, and high carrier concentration while with increasing in content the reverse is noted. Typical optical absorption vs wavelength behavior for the CuInSe2 thin films is presented and interpreted in terms of the absorption edge and free carrier absorption. DOE

N79-14578# Brookhaven National Lab., Upton, N. Y. Energy Technology Assessment Group.

ENERGY USE IN JAPAN AND THE UNITED STATES

Andres Doernberg 1977 27 p refs Presented at the RFF-EPRI Workshop on Intern. Energy Consumption Comparisons, 15-16 Sep. 1977

(BNL-23101) Avail: NTIS HC A03/MF A01

The energy consumption patterns in Japan and the United States are compared in terms of per capita Gross Domestic Product (GDP). Energy use in the residential sector, transportation sector, and the industrial sector of the two countries is considered. Import/export practices, prices and taxes for petroleum products, and energy supplies are among the factors discussed. Japan's lower energy consumption is attributed to larger use of passenger rail transportation, smaller consumption of space heat, and more efficient iron and steel industry. J.M.S.

N79-14579# Westinghouse Electric Corp., Tampa, Fla.

DESIGN AND COST STUDY OF A NICKEL-IRON OXIDE BATTERY FOR ELECTRIC VEHICLES. VOLUME 2: PUBLIC REPORT Final Report

R. E. Vaill Aug. 1977 73 p refs 2 Vol.

(Contract ANL-31-109-38-3723)

(ANL-K-3723-Vol-1) Avail: NTIS HC A04/MF A01

A nickel-iron oxide battery design concept proposed to meet the performance and cost objectives for a viable electric vehicle battery is described. This design is based to a large extent on proven past practice, but incorporates those design improvements which are expected to be realizable within a two-year development program. Developmental problems are addressed and the methods of solution identified. The manufacturing cost of the proposed design is identified for annual production quantities of 1,000, 10,000, and 100,000 25 KWHR batteries. Based on the high volume estimates of material, labor, and capital requirements, a selling price of $60/KWHR is found to be attainable. Battery test requirements are identified which will serve to define the performance characteristics of interest to a potential user. DOE

N79-14580# Swedish Council for Building Research, Stockholm.

STORAGE OF LOW-TEMPERATURE HEAT IN SALT-HYDRATE MELTS: CALCIUM CHLORIDE HEXAHYDRATE

Bo. Carlsson, Hans Stymne, and Gunnar Wettermark 1978 140 p refs

(PB-285859/5; ISBN-91-540-2889-2; D12:1978) Avail: NTIS HC A07/MF A01 CSCL 07D

Topics covered include: storage of low-temperature heat in melts; chloride hexahydrate as a heat storage medium; methods of adapting CaCl2.6H2O for use as a heat storage medium-investigations of the chemical solubility properties of the CaCl2; H2O system; heat transfer characteristics of a heat of fusion storage system based on calcium chloride hexahydrate; and the development and construction of a heat of fusion storage system based on calcium chloride hexahydrate. GRA

N79-14581# National Oceanic and Atmospheric Administration, Washington, D. C.

HARNESSING TIDAL ENERGY

Aug. 1978 15 p refs

(PB-286671/3; CIO-78/2; NOAA-78082203) Avail: NTIS HC A02/MF A01 CSCL 10A

About 3,000,000 megawatts (MW) of power are continuously dissipated through the motion of the tides over the surface of the earth. Due to physical limitations, only 2 percent of this may ever be harnessed. This amounts to about 5 percent of the present worldwide power generation from all sources. This inexhaustible power source can make a small, but significant, contribution. The background and fundamental principles of tidal power are discussed and recent developments are given. A selected listing of some of the published material relating to electrical power generation from tides is included. GRA

N79-14582# Aerospace Corp., Germantown, Md. Environment and Safety Directorate.

WATER RELATED CONSTRAINTS IN ENERGY PRODUCTION Final Report

Norman F. Hampton Jun. 1978 271 p refs

(PB-285713/4; ATR-78(9409)-1) Avail: NTIS HC A12/MF A01 CSCL 10A

The relationships between water resources and this Nation's efforts to achieve energy self-sufficiency are elucidated. Water is demanded by the energy industries for mining, reclamation of mined lands, transportation, onsite processing and cooling, refining, and conversion of fuels to other forms of energy. In addition, water is demanded for municipal, industrial, agricultural, navigational, and recreational uses and to maintain ambient water quality and fish and wildlife habitats. Given these demands, conflicts in water resource allocation are likely to arise, particularly in areas of limited water supply. The information contained herein is intended to provide a first-order assessment preparatory to resource allocation decisionmaking. GRA

N79-14583# General Accounting Office, Washington, D. C. Energy and Minerals Div.

REGION AT THE CROSSROADS: THE PACIFIC NORTHWEST SEARCHES FOR NEW SOURCES OF ELECTRIC ENERGY Report to the Congress

10 Aug. 1978 270 p refs

(PB-284691/3; EMD-78-76) Avail: NTIS HC A12/MF A01 CSCL 10A

The options for the Pacific Northwest in meeting its electric energy needs through the year 2000 and the Bonneville Power Administration's role in meeting those needs are discussed. GRA

N79-14584# National Technical Information Service, Springfield, Va.

SILVER CELLS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Nov. 1978

Mona F. Smith Nov. 1978 290 p Supersedes NTIS/PS-77/1026; NTIS/PS-76/0879; NTIS/PS-75/649

(NTIS/PS-78/1191/2; NTIS/PS-77/1026; NTIS/PS-76/0879; NTIS/PS-75/649) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

Citations of Federally-funded research are presented on silver cell primary and storage batteries with respect to electrochemistry, separators, hermetic seals, electrolytes, electrodes, charging, reliability, and applications. Studies concerning silver zinc cells and silver cadmium cells are discussed in the majority of the abstracts. This updated bibliography contains 283 abstracts, 16 of which are new entries to the previous edition. GRA

N79-14585# National Technical Information Service, Springfield, Va.

SILVER CELLS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1978

Mona F. Smith Nov. 1978 110 p Supersedes NTIS/PS-77/1027; NTIS/PS-76/0880

(NTIS/PS-78/1192/0; NTIS/PS-77/1027; NTIS/PS-76/0880) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

Worldwide research reports on silver cell primary, storage, and solid state batteries are cited. Studies on electrochemistry, electrodes, electrolytes, separators, reliability, charging, and performance are covered. The use of these batteries in spacecraft, electric automobiles, and submersibles is discussed. This updated bibliography contains 104 abstracts, seven of which are new entries to the previous edition. GRA

N79-14586# Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.

THE GROUND WATER AND ENERGY SUPPLY SITUATION FOR GREAT PLAINS IRRIGATION

Ajay K. Sanghi and David Johnson Apr. 1978 43 p refs (Grant NSF AER-77-17031)

(PB-286002/1; CBNS-AE-10; NSF/RA-780018) Avail: NTIS HC A03/MF A01 CSCL 10A

The energy supply and groundwater situations for irrigation in Texas, Oklahoma, Kansas, and Nebraska are assessed. The highly seasonal distribution of electricity demand for irrigation creates a peak load problem for electricity cooperatives in the region. This problem is most serious in Nebraska, where it has led to restrictions or delays in new irrigation hookups. A survey of available data on saturated thickness of the aquifer, depth to water table, and annual rate of decline (or rise) in the water table was conducted for counties in the four states overlying the Ogallala Formation. The most serious problems are in Texas, which has the greatest average depth to the water table, the greatest average yearly water table decline, and the lowest average saturated thickness. GRA

N79-14587# National Technical Information Service, Springfield, Va.

COMBINED CYCLE POWER GENERATION. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Oct. 1978

Audrey S. Hundemann Nov. 1978 112 p Supersedes NTIS/PS-77/0991 2 Vol.

(NTIS/PS-78/1156/5; NTIS/PS-77/0991) Copyright. Avail: NTIS HC $28.00/MF $28.00 CSCL 10B

Federally-funded research pertaining to design, efficiency, cost, resource requirements, and environmental aspects of combined cycle power plants is discussed. Abstracts primarily deal with use of coal gasification in conjunction with combined gas and steam turbine generation, including subsystems development studies. This updated bibliography contains 106 abstracts, 37 of which are new entries to the previous edition. GRA

N79-14588# National Technical Information Service, Springfield, Va.

COMBINED CYCLE POWER GENERATION. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Oct. 1978

Audrey S. Hundemann Nov. 1978 159 p Supersedes NTIS/PS-77/0992 2 Vol.

(NTIS/PS-78/1157/3; NTIS/PS-77/0992) Copyright. Avail: NTIS HC $28.00/MF $28.00 CSCL 10B

The design, performance, efficiency, economics, and environmental aspects of combined cycle power plants are discussed. Abstracts of worldwide research cover the use of waste heat from gas turbines to drive steam turbines and the thermal efficiency of integrated gasification combined cycle plants using low or intermediate Btu gas. A few abstracts pertain to control and instrumentation used in the plants. This updated bibliography contains 153 abstracts, 38 of which are new entries to the previous edition. GRA

N79-14589# National Technical Information Service, Springfield, Va.

MAGNESIUM BATTERIES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Nov. 1978

Mona F. Smith Nov. 1978 139 p Supersedes NTIS/PS-77/1088; NTIS/PS-76/0941

(NTIS/PS-78/1182/1; NTIS/PS-77/1088; NTIS/PS-76/0941) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

Federally funded research reports on seawater batteries, dry tape batteries, storage batteries, primary batteries, and reserve batteries are cited. Design, development, electrochemistry, component, reliability, and testing are covered. This updated bibliography contains 132 abstracts five of which are new entries to the previous edition. GRA

N79-14590# National Technical Information Service, Springfield, Va.

MAGNESIUM BATTERIES. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1978

Mona F. Smith Nov. 1978 58 p Supersedes NTIS/PS-77/1089; NTIS/PS-76/0942
(NTIS/PS-78/1183/9; NTIS/PS-77/1089; NTIS/PS-76/0942) Avail: NTIS HC $28/00/MF $28.00 CSCL 10C

Worldwide research on magnesium battery development, performance, and electrochemistry is cited. The majority of studies concern seawater batteries, biomedical implants, and thermal batteries. This updated bibliography contains 51 abstracts, of which are new entries to the previous edition. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N79-14591*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DESCRIPTION AND FIELD TEST OF AN IN SITU COLIFORM MONITORING SYSTEM

David C. Grana and Judd R. Wilkins Jan. 1979 37 p refs (NASA-TP-1334; L-12361) Avail: NTIS HC A03/MF A01 CSCL 13B

A prototype in situ system for monitoring the levels of fecal coliforms in shallow water bodies was developed and evaluated. This system was based on the known relationship between the concentration of the coliform bacteria and the amount of hydrogen they produce during growth in a complex organic media. The prototype system consists of a sampler platform, which sits on the bottom; a surface buoy, which transmits sampler-generated data; and a shore station, which receives, displays the data, and controls the sampler. The concept of remote monitoring of fecal coliform concentrations by utilizing a system based on the electrochemical method was verified during the evaluation of the prototype. Author

N79-14592# Federal Aviation Administration, Washington, D. C. Office of Environmental Quality.

HIGH ALTITUDE POLLUTION PROGRAM: A STATUS REPORT PREPARED IN ACCORDANCE WITH PL 95-95

N. Sundararaman Dec. 1977 36 p refs
(AD-A051129; FAA-AEQ-77-16) Avail: NTIS HC A03/MF A01 CSCL 06/6

The past and planned activities of the High Altitude Pollution Program (HAPP) are summarized. A preliminary HAPP assessment of the stratospheric effects from aviation indicates that there is no imminent threat of ozone reduction from any type of existing aircraft, though substantial uncertainties still remain to be unravelled. Author (GRA)

N79-14593# Perkin-Elmer Corp., Norwalk, Conn. Electro-Optical Div.

HIGH ALTITUDE POLLUTION PROGRAM. STRATOSPHERIC MEASUREMENT SYSTEM FEASIBILITY STUDY Progress Report, Oct. 1977 - Jan. 1978

Norman H. Macoy, Sherman K. Poultney, Lloyd M. Logan, and Mary Rotheram Jan. 1978 320 p refs
(Contract DOT-FA77WA-4080)
(AD-A059330; PE-13566; FAA-AEQ-78-10) Avail: NTIS HC A14/MF A01 CSCL 13/2

This report pertains to the feasibility of developing a Stratospheric Measurement System, which is a key element of the FAA High Altitude Pollution Program (HAPP). Analytical measurement concepts considered during the study for the oxides of nitrogen and ozone are identified and ranked in Tables 3-1 and 3-40, respectively. Scientific ballooning considerations were also examined in the main study to the extent necessary to determine overall feasibility of developing a Stratospheric Measurement System (SMS). The conclusion of the study is that there exists a set of analytical techniques that can be flown on a balloon platform to obtain the specified HAPP/SMS measurements. A conceptual design of the integrated system is presented. GRA

N79-14594# Civil and Environmental Engineering Development Office, Tyndall AFB, Fla. Environmental Assessment Research Div.

THE EVAPORATION AND DISPERSION OF HYDRAZINE PROPELLANTS FROM GROUND SPILLS Final Report, Jul. 1977 - Jul. 1978

Gerhard Ille and Charles Springer (Arkansas Univ., Fayetteville) Aug. 1978 94 p refs
(AF Proj. 1900)
(AD-A059407; CEEDO-TR-78-30) Avail: NTIS HC A05/MF A01 CSCL 07/3

A propellant evaporation and dispersion model has been developed for hydrazine ground spills. The evaporation algorithm computes the rate of evaporation as a function of soil temperature, solar insulation, air temperatures, wind velocity and spill dimensions. The single source Gaussian dispersion portion calculates the downwind, ground-level centerline concentration based on dispersion coefficients available in current EPA models. The dispersion algorithm also computes the crosswind dimension of a hazard corridor defined by the Short Term Public Limit (STPL) or other selected concentrations. GRA

N79-14595# Environmental Research and Technology, Inc., Concord, Mass.

CONCORDE AIR QUALITY MONITORING AND ANALYSIS PROGRAM AT DULLES INTERNATIONAL AIRPORT. VOLUME 2: APPENDIXES Final Report, Jun. 1976 - Dec. 1977

D. G. Smith, R. J. Yamartino (Argonne National Lab., Ill.), C. Benkley, R. Issacs, and J. Lee Dec. 1977 160 p
(DOT-FA76WA-3816)
(AD-A056506; ERT-P-2495-Vol-2; FAA-AEQ-77-14A) Avail: NTIS HC A08/MF A01 CSCL 01/3

On February 4, 1976, the Secretary of Transportation ordered the FAA to monitor Concorde emissions at Dulles International Airport during its initial 16 month trial period. To comply with this order, it was necessary to measure the ambient pollution levels (background) in and around Dulles Airport and to trace the dispersion of emissions from a single Concorde aircraft. While the more conventional background measurements could be easily performed, there was no known case where the vertical and horizontal profile of the emission plume from a single aircraft had been identified. Special instruments were required to measure the discrete, non-steady nature of the dispersion of the aircraft plume. The final measurement system, which consisted of continuously recording electro-chemical sensors coupled with high-speed chart recorders, successfully detected CO emissions from a single aircraft. GRA

N79-14596# Environmental Research and Technology, Inc., Concord, Mass.

CONCORDE AIR QUALITY MONITORING AND ANALYSIS PROGRAM AT DULLES INTERNATIONAL AIRPORT, VOLUME 1 Final Report, Jun. 1976 - Dec. 1977

D. G. Smith, R. J. Yamartino (Argonne Natl. Lab., Ill.), C. Benkley, R. Isaacs, J. Lee, and D. Chang Dec. 1977 168 p refs
(Contract DOT-FA76WA-3816)
(AD-A056644; ERT-P-2495-Vol-1; FAA-AEQ-77-14-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 01/3

On February 4, 1976, the Secretary of Transportation ordered the FAA to monitor Concorde emissions at Dulles International Airport during its initial 16 month trial period. To comply with this order, it was necessary to measure the ambient pollution levels (background) in and around Dulles Airport and to trace the dispersion of emissions from a single Concorde aircraft. While the more conventional background measurements could be easily performed, there was no known case where the vertical and horizontal profile of the emission plume from a single aircraft had been identified. Special instruments were required to measure the discrete, non-steady nature of the dispersion of the aircraft plume. The final measurement system, which consisted of continuously recording electro-chemical sensors coupled with high-speed chart recorders, successfully detected CO emissions from a single aircraft. GRA

N79-14597# Federal Aviation Administration, Washington, D. C. Office of Environmental Quality.

THE FEASIBILITY, PRACTICABILITY, AND COST OF THE SOUNDPROOFING OF SCHOOLS, HOSPITALS, AND PUBLIC HEALTH FACILITIES LOCATED NEAR AIRPORTS Report to Congress

Jul. 1977 48 p
(AD-A056529; FAA-EQ-78-14) Avail: NTIS HC A03/MF A01 CSCL 13/13

This report concludes that soundproofing can achieve noise reductions of 10 to 20 db, is feasible and practicable, and may be cost effective at specific locations. Author (GRA)

N79-14598# Army Engineer Waterways Experiment Station, Vicksburg, Miss.

LAND USE OF DREDGED MATERIAL CONTAINMENT AREAS. PRODUCTIVE USE EXAMPLES

Ogden Beeman and A. P. Benkendorf Aug. 1978 60 p refs Prepared by Beeman/Benkendorf, Portland, Ore.
(Contract DACW-76-C-0132)
(AD-A059723; WES-MP-D-78-4) Avail: NTIS HC A04/MF A01 CSCL 13/3

The study documents examples of productive land uses of dredged material containment areas. The examples were obtained from published literature and project descriptions and discussions with persons knowledgeable in the planning and execution of dredging projects. The examples are from 19 states and six foreign countries. The sites range from those filled over 50 years ago, which have been used productively for many years, to projects in various stages of development. Projects are documented within the following land use categories: recreational, industrial/commercial, agricultural, institutional, material transfer, waterway related, and multiple purpose. Based on the examples cited and information analyzed during the study, the site-selection process is discussed from historical and modern perspectives. Examples of recent processes and approaches to candidate site selection implemented by communities in the United States and abroad are described. Productive land uses tend to fall within a hierarchy of complexity and intensity. It is suggested that this hierarchy is accompanied by a need on the part of the sponsor or developer to recognize and deal with a greater number of planning conditions to achieve a greater land use intensity. These planning conditions are interrelated to several identifiable planning actions that, if properly undertaken, can significantly enhance the productive use of the landform created at the disposal site. GRA

N79-14599# Environmental Systems Service of Tallahassee, Inc., Fla.

HABITAT DEVELOPMENT FIELD INVESTIGATIONS, APALACHICOLA BAY MARSH DEVELOPMENT SITE, APALACHICOLA BAY, FLORIDA Final Report

William L. Kruczynski, Robert T. Huffman, and Mary K. Vincent Aug. 1978 45 p refs
(Contract DACW01-77-C-0022)
(AD-A059722; WES-TR-D-78-32) Avail: NTIS HC A03/MF A01 CSCL 13/3

The feasibility of developing marsh on fine-grained and coarse-grained dredged material in a brackish water intertidal environment was tested at a dredged material disposal site in Apalachicola Bay, Florida. Smooth cordgrass (Spartina alterniflora) and saltmeadow cordgrass (Spartina patens) sprigs were planted at different spacing intervals to evaluate optimum conditions for growth. Natural invasion of plant species was also documented during the period of study. Results indicate that the development of marsh plants on dredged material can be readily accomplished in the area of study. Author (GRA)

N79-14600# Versar, Inc., Springfield, Va.

INVESTIGATION OF THE ENVIRONMENTAL CONSEQUENCES OF DISPOSAL OF THE LITHIUM ORGANIC-ELECTROLYTE/SO2 BATTERY Final Report, Sep. 1976 - Jan. 1978

K. Crumrine, E. Juergens, C. Colburn, M. Slimak, and J. Freed Mar. 1978 124 p refs Revised
(Contract DAAB07-76-C-1752)
(AD-A059512; ECOM-76-1752-F; Rept-495-F) Avail: NTIS HC A06/MF A01 CSCL 07/2

This report contains recommendations for disposal of lithium organic-electrolyte/SO2 batteries (standard composition and modified composition) based upon a review of toxicity of battery constituents and laboratory analysis of leachate and solubility tests from cross-sectioned batteries. Laboratory analysis identified an average of 22 mg of cyanide ion per cell in the discharged standard composition cell and 1.6 mg in an undischarged cell. Soil leachate column tests showed significant quantities of cyanide in the leachate from discharged standard composition cells. Disposal recommendations for the standard cell include secured landfills or disposal ponds. Laboratory analysis of solubility tests showed an average of 0.16 mg of cyanide per cell in the discharged modified composition cell. Disposal recommendations for the modified cell are sanitary landfills or the equivalent.
Author (GRA)

N79-14601# Pacific Environmental Services, Inc., Santa Monica, Calif.

CONTROL OF VOLATILE ORGANIC EMISSIONS FROM EXISTING STATIONARY SOURCES. VOLUME 7: FACTORY SURFACE COATING OF FLAT WOOD PANELING

Jun. 1978 66 p refs Sponsored by EPA, Research Triangle Park, N. C.
(PB-286199/5; EPA-450/2-78-032-Vol-7) Avail: NTIS HC A04/MF A01 CSCL 13B

Guidance for development of regulations to limit emissions of volatile organic compounds from the factory surface coating of flat wood panels is provided. This guidance includes emission limits for three categories of panels which represents Reasonably Available Control Technology (RACT) for these operations. The industry is described, methods for reducing organic emissions are reviewed, and monitoring and enforcement aspects are discussed. GRA

N79-14602# Los Alamos Scientific Lab., N. Mex.

TRACE ELEMENT CHARACTERIZATION AND REMOVAL/RECOVERY FROM COAL AND COAL WASTES Progress Report, 1 Oct. 1977 - 30 Sep. 1978

Eugene M. Wewerka and Joel M. Williams Dec. 1977 15 p
(Contract W-7405-eng-36)
(LA-7048-PR) Avail: NTIS HC A02/MF A01

Research activities are described for FY 78 for the Environmental Protection Agency (EPA)-Department of Energy (DOE) program on environmental contamination from trace elements in coal preparation wastes. The main objectives of this program are (1) to assess and define the technology options to control or prevent the release of environmentally harmful trace elements in the drainages from high-sulfur coal preparation wastes, and (2) to identify the trace elements of greatest environmental concern in the aqueous discharges from selected samples of Appalachian Basin coal refuse, with the aim of delineating suitable pollution control technology or research, development, and demonstration programs. The details of the experimental activities to accomplish these objectives are discussed herein. DOE

N79-14603# Environmental Protection Agency, Washington, D. C.

FEDERAL NOISE PROGRAM SERIES. VOLUME 3: DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION: NOISE POLICY AND RELATED ENVIRONMENTAL PROCEDURES

Jul. 1978 85 p refs
(PB-285940/3; EPA-550/9-77-357) Avail: NTIS HC A05/MF A01 CSCL 13B

The important features of the Federal Highway administration's noise policy and related environmental procedures are discussed. Associated problems with the policy without attempting to present an evaluation were also identified. The study served as an aid to persons concerned with noise abatement and control activities in the Federal Government. GRA

N79-14604# New Mexico State Univ., University Park. Water Resources Research Inst.

WATER TREATMENT FOR SMALL PUBLIC SUPPLIES

D. B. Wilson, H. G. Folster, G. Kramer, S. Hanson, W. Boyle, and C. Bennett May 1978 74 p refs
(Contract DI-14-34-0001-7515; OWRT Proj. T-0009(7515)(1))
(PB-285963/5; WRRI-095; W78-11208) Avail: NTIS HC A04/MF A01 CSCL 13B

Approximately 800 community type public water supplies in New Mexico are initially affected by the regulations adopted by the U.S. Environmental Protection Agency under the Safe Drinking Water Act. The selection, design, construction, and operating procedures for a portable demonstration water treatment system using reverse osmosis and electrodialysis is described

which is to provide information to small New Mexico communities for improving their drinking water supplies to meet existing regulations. Operating conditions and information for an engineering evaluation of reverse osmosis and electrodialysis was developed as well as their secondary support processes. GRA

N79-14605# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.

CONTROL OF VOLATILE ORGANIC EMISSIONS FROM EXISTING STATIONARY SOURCES. VOLUME 6: SURFACE COATING OF MISCELLANEOUS METAL PARTS AND PRODUCTS

Vera Gallagher and John Pratapas Jun. 1978 81 p refs
(PB-286157/3; EPA-450/2-78-015; OAQPS-1.2-101) Avail: NTIS HC A05/MF A01 CSCL 13B

The necessary guidance for development of regulations to limit emissions of volatile organic compounds (VOC) from the coating operations of miscellaneous metal parts and products is presented. This guidance includes emission limits which represent reasonably available control technology for the miscellaneous metal part and product industries, describes the industries, shows the methods by which VOC emissions can be reduced in these industries, and describes the monitoring and enforcement aspects. GRA

N79-14606# Transportation Systems Center, Cambridge, Mass.

THE AIRPORT NOISE PREDICTION MODEL--MOD 7 Final Report, Jul. 1974 - Jul. 1977

R. H. Hinckley and W. Messcher Jul. 1978 186 p
(PB-285789/4; DOT-TSC-RSPA-78-19) Avail: NTIS HC A09/MF A01 CSCL 01C

The MOD 7 Airport Noise Prediction Model is fully operational. The language used is FORTRAN, and it has been run on several different computer systems. Its capabilities include prediction of noise levels for angle parameter changes, for multiple changes, and for an entire airport's operations. Some of the single parameters include: type of aircraft, flight paths, speed thrust, and noise abatement procedures. GRA

N79-14607# Environmental Research and Technology, Inc., Concord, Mass.

A REVIEW OF REGIONAL-SCALE AIR QUALITY MODELS FOR LONG DISTANCE DISPERSION MODELING IN THE FOUR CORNER REGION

John A. Nuber, Arthur Bass, Michael T. Mills, and Charles S. Morris Apr. 1978 85 p refs
(Contract NOAA-03-6-02-35254)
(PB-285627/6; EPA-600/7-78-066) Avail: NTIS HC A05/MF A01 CSCL 04A

Available air quality simulation models that are appropriate to long-range transport of atmospheric pollutants are reviewed. A number of constraints were used to select models for review. These included the relative ease and costs of modification for use in the Four Corners Area, the computer implementation restrictions, the computational, and data and technical resources required for program utilization, the flexibility for multiple-scenario exercise to address both short-term and long-term ambient air quality issues. To facilitate the description and intercomparison of the various models, a 'model characteristics' outline form of presentation was used. GRA

N79-14608# Argonne National Lab., Ill. Radiological and Environmental Research Div.

AN EXAMINATION OF SOME MICROMETEOROLOGICAL METHODS FOR MEASURING DRY DEPOSITION Interim Report, Jan. 1977 - Jan. 1978

Bruce B. Hicks and Marvin L. Wesely Jul. 1978 29 p refs
(Contract EPA-IAG-D6-F815)
(PB-285765/4; EPA-600/7-78-116) Avail: NTIS HC A03/MF A01 CSCL 04A

Several experimental methods to determine the vertical fluxes of pollutants over natural surfaces are studied. The possible experimental methods include aerodynamic, modified Bowen ratio, eddy correlation, variance, and eddy accumulation. The relative advantages and disadvantages of these methods are discussed, with consideration being given to the sensor response time and accuracy. The roles of atmospheric stability and the zero plane, site and instrumental requirements, and averaging time are discussed for flux measurements. GRA

N79-14609# Midwest Research Inst., Kansas City, Mo.

FINE PARTICLE EMISSIONS INFORMATION SYSTEM REFERENCE MANUAL, JANUARY - MAY 1978

M. P. Schrag Jun. 1978 102 p refs
(Contract EPA-68-02-2641)
(PB-286004/7; EPA-600/8-78-007) Avail: NTIS HC A06/MF A01 CSCL 05B

A basic reference manual on the Fine Particle Emissions Information System (FPEIS), a computerized database on primary fine particle emissions to the atmosphere from stationary point sources is reported. The FPEIS is a component of the Environmental Assessment Data Systems (EADS) which is designed to aid researchers in environmental assessment and fine particle control technology development activities. The FPEIS contains source test data including particle size distributions; chemical, physical, and bioassay testing results performed on particulate samples; design and typical operating data on particulate control systems applied; process descriptions and the sources; and descriptions of the sampling equipment and techniques employed. The FPEIS describes the data types contained in the database, and identifies and discusses the input data requirements and protocol. GRA

N79-14610# Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Water Quality Management.

DATA BASE SYSTEM FOR STATE WATER QUALITY MANAGEMENT INFORMATION SYSTEM Final Report

John Kitch May 1978 33 p refs
(Grant EPA-S-801000)
(PB-286180/5; EPA-600/5-78-007) Avail: NTIS HC A03/MF A01 CSCL 05B

The WAMIS Release II Data Base Management System is described. The system design, development procedures, overview of data and a discussion of problems and recommendations are included. The appendixes contain the system detail. GRA

N79-14611# Purdue Univ., Lafayette, Ind. Water Resources Research Center.

ANALYSIS OF THE CONTROL AND PERFORMANCE OF ALGAL-WASTEWATER STABILIZATION PONDS

F. P. Incropera Sep. 1978 91 p refs Sponsored by Interior Dept.
(PB-285709/2; PWRRC-TR-104; W78-11065;
OWRT-A-042-IND(4)) Avail: NTIS HC A05/MF A01 CSCL 13B

Mathematical models were developed to assess means of maintaining thermal control and assessing the impact on wastewater treatment and algal production. The thermal response and control of a shallow pond which uses waste heat in a closed cycle cooling system was considered. Calculations suggested a heat exchanger design involving a network of 30m long, 25mm OD pipes on 0.15m centers. The design provides a reasonable compromise between initial costs and performance and enables maintaining near-optimum pond temperatures throughout the year for climatic conditions typical of the Midwest. Calculations based on a model of a completely mixed activated sludge wastewater treatment system revealed the benefits to be derived from operation at elevated temperatures. Effluent quality is improved for any increase in temperature from 10 to 30 C. Calculations based on a model of algal growth at optimum temperatures predicted daily yields which are in agreement with maximum yields which have either been measured or inferred from field studies. GRA

N79-14612# General Accounting Office, Washington, D. C. Community and Economic Development Div.

CONGRESSIONAL GUIDANCE NEEDED ON THE ENVIRONMENTAL PROTECTION AGENCY'S RESPONSIBILITIES FOR PREPARING ENVIRONMENTAL IMPACT STATEMENTS

13 Sep. 1978 49 p
(PB-285735/7; CED-78-104) Avail: NTIS HC A03/MF A01 CSCL 13B

Most types of actions taken by the Environmental Protection Agency are not now subject to the National Environmental Policy

Act's requirement that Federal agencies prepare environmental impact statements on major actions significantly affecting the environment. The Agency generally claims an exemption from the requirement except to grants to construct publicly owned wastewater treatment facilities and permits issued to dischargers of pollutants into navigable waters. The Agency voluntarily prepares environmental impact statements on some additional actions. A reevaluation of the need for continuing the statutory exemptions from the environmental impact statement requirement for most types of air and water quality actions is recommended along with a clarification of the Agency's responsibilities for preparing these statements on other actions. GRA

N79-14613# Green (Katherine A.), Consultant, Rockville, Md.
A CONCEPTUAL ECOLOGICAL MODEL FOR CHESAPEAKE BAY
Katherine Green Sep. 1978 31 p refs Sponsored in part by EPA
(SFWB Order 144807)
(PB-285906/4; FWS/OBS-78/69) Avail: NTIS HC A03/MF A01 CSCL 13B

A conceptual model for the Chesapeake Bay ecosystem (wetlands, tributaries, and bay proper) was developed as an interrelated series of diagrams showing carbon and nutrient. Information was based on an analysis of local literature and discussions with scientists who are studying the Bay. The ecological functions that produce the resources of commercial and recreational fisheries, habitat for migratory birds and other wildlife waste disposal, and aesthetic water quality are indicated. Physical (light, turbidity, mixing, transport, sedimentation) and chemical (sediment-water interactions, presence of pollutants) aspects of the environment modify the rates of biological processes (primary production nutrient regeneration, larval survival). A detailed ecosystem model combining the wetlands, plankton, seagrasses, other benthos, and fish trophic dynamics submodels shows the importance of material transfer and interactions between subsystems. GRA

N79-14614# North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
A CRITICAL REVIEW OF AMBIENT AIR ALDEHYDE MEASUREMENT METHODS AND AN ANALYSIS OF HOUSTON ALDEHYDE DATA. PART 1: REVIEW OF MEASUREMENT METHODS
Richard M. Kamens and Harvey E. Jeffries Jan. 1978 30 p refs Sponsored by Chamber of Commerce, Houston, Tex.
(PB-285551/8; HAOS-09) Avail: NTIS HC A03/MF A01 CSCL 07D

Various ambient air aldehyde measurement methods are critically reviewed, and recommendations are presented for measuring aldehydes in the Houston area. GRA

N79-14615# North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
A CRITICAL REVIEW OF AMBIENT AIR ALDEHYDE MEASUREMENT METHODS AND AN ANALYSIS OF HOUSTON ALDEHYDE DATA. PART 2: AN ANALYSIS OF HOUSTON ALDEHYDE DATA AND COMPARISON WITH CINCINNATI AND ST. PAUL DATA
Harvey E. Jeffries and Richard M. Kamens Mar. 1978 75 p Sponsored by Chamber of Commerce, Houston, Tex.
(PB-285552/6; HAOS-10) Avail: NTIS HC A04/MF A01 CSCL 07D

Results of a study to examine Houston aldehyde data spatially and temporally for the years 1973-1975 are presented. Houston aldehyde data characteristics are compared with those of Cincinnati and St. Paul. GRA

N79-14616# Air Pollution Technology, Inc., San Diego, Calif.
PARTICULATE CONTROL HIGHLIGHTS: FINE PARTICLE SCRUBBER RESEARCH Final Task Report, May 1977 - Mar. 1978
S. Calvert and R. Parker Jun. 1978 19 p refs
(Contract EPA-68-02-2190)
(PB-285135/0; EPA-600/8-78-005A) Avail: NTIS HC A02/MF A01 CSCL 07A

Major accomplishments of EPA's scrubbers program include, publication of the Scrubber Handbook, development and demonstration of flux force/condensation scrubbing; generation of extensive scrubber performance data; development of design methods and criteria for entrainment separation; development and evaluation of novel devices for fine particle control; and presentation of two technical symposia on fine particle scrubbing. GRA

N79-14617# Air Pollution Technology, Inc., San Diego, Calif.
PARTICULATE CONTROL HIGHLIGHTS: PERFORMANCE AND DESIGN MODEL FOR SCRUBBERS Final Task Report, Sep. 1977 - Apr. 1978
S. Yung and S. Calvert Jun. 1978 28 p refs
(Contract EPA-68-02-2190)
(PB-285136/8; EPA-600/8-78-005B) Avail: NTIS HC A03/MF A01 CSCL 07A

All available information concerning wet scrubber theory and practice was reviewed. The best available engineering design methods were evaluated and, where necessary, new or revised methods were developed to provide as sound a basis as possible for predicting performance. GRA

N79-14618# Southern Research Inst., Birmingham, Ala.
EVALUATION OF ELECTROSTATIC PRECIPITATOR DURING SRC COMBUSTION TESTS Final Task Report, Apr. - Aug. 1977
Grady B. Nichols and William J. Barrett Jul. 1978 57 p refs
(Contract EPA-68-02-2610)
(PB-285864/5; EPA-600/7-78-129) Avail: NTIS HC A04/MF A01 CSCL 13B

An electrostatic precipitator (ESP) and associated environmental factors were evaluated during the burning of solvent refined coal (SRC) in a boiler at Plant Mitchell of the Georgia Power Company. The effort was part of an overall study of the use of SRC in a full-scale electric power plant. Results of a performance evaluation of the ESP are reported and interpreted. Samples of stack emissions were collected with a Source Assessment Sampling System (SASS) train for chemical analysis. GRA

N79-14619# Environmental Monitoring and Support Lab., Las Vegas, Nev.
DISTRIBUTION OF PHYTOPLANKTON IN ILLINOIS LAKES
M. K. Morris, L. P. Williams, W. D. Taylor, F. A. Hiatt, and S. C. Hern May 1978 134 p refs
(PB-285411/5; EPA-600/3-78-050) Avail: NTIS HC A07/MF A01 CSCL 13B

Data on the species and abundance of phytoplankton in the 31 lakes sampled by the National Eutrophication Survey in the State of Illinois are presented. Results from the calculation of several water quality indices are also included (Nygaard's Trophic State index, Palmer's Organic Pollution index, and species diversity and abundance indices). GRA

N79-14620# General Accounting Office, Washington, D. C. Community and Economic Development Div.
ENVIRONMENTAL EFFECTS OF AIRPORT DEVELOPMENT: BETTER ASSESSMENT NEEDED
22 Aug. 1978 38 p
(PB-285798/5; CED-78-156) Avail: NTIS HC A03/MF A01 CSCL 13B

Airports have problems being accepted by neighboring communities because of their noise and other environmental effects, but this acceptance is vital to the growth of aviation. The Federal Aviation Administration could help rectify this problem by requiring environmental findings for an airport's planned development. This would facilitate community acceptance and reduce the cost and time spent complying later with the National Environmental Policy Act. GRA

N79-14621# California Inst. of Tech., Pasadena. Dept. of Chemical Engineering.
AIR MONITOR SITING BY OBJECTIVE
Masato Koda and John H. Seinfeld Jun. 1978 89 p refs
(Contract EPA-68-03-2441)
(PB-285804/1; EPA-600/4-78-036) Avail: NTIS HC A05/MF A01 CSCL 13B

A method is developed whereby measured pollutant concentrations can be used in conjunction with a mathematical air quality model to estimate the full spatial and temporal concentra-

tion distributions of the pollutants over a given region. The method is based on the application of estimation theory to systems described by partial differential equations, such as the atmospheric diffusion equation. A computer code was developed that can process monitoring data to produce concentration distribution estimates. The code was tested extensively on a hypothetical airshed, designed to illustrate the key features of the method. GRA

N79-14622# Midwest Research Inst., Kansas City, Mo.
FINE PARTICLE EMISSIONS INFORMATION SYSTEM USER GUIDE Progress Report, Jan. - May 1978
M. P. Schrag Jun. 1978 308 p
(Contract EPA-68-02-2641)
(PB-285877/7; EPA-600/8-78-006) Avail: NTIS
HC A14/MF A01 CSCL 13B

An extensive user guide to the Fine Particle Emissions Information System (FPEIS), a computerized database on primary fine particle emissions to the atmosphere from stationary point sources is reported. The FPEIS is a component of the Environmental Assessment Data Systems (EADS) which is designed to aid researchers in environmental assessment and fine particle control technology developed activities. Detailed instructions for encoding FPEIS datasets, along with a copy of the FPEIS data input form are presented. Procedures are discussed which will provide users with access to the FPEIS either by direct computer request for authorized National Computer Center (NCC) accounts or by written request to the EPA project officer. A list of standard data inquiry and retrieval requests, with instructions for their use is given. GRA

N79-14623# Physical Dynamics Northwest, Bellevue, Wash.
INSTRUMENTAL MEASUREMENTS OF VISIBILITY Final Report, May 1977 - Jan. 1978
John M. Lansinger 1 Mar. 1978 111 p Sponsored by Houston Chamber of Commerce, Tex. Prepared for Radian Corp.
(PB-285548/4; PD/NW-78/172; HAOS-04) Avail: NTIS
HC A06/MF A01 CSCL 14B

A field measurement program involving telephotometer and nephelometer measurements in support of the Houston Area Oxidant Study (HAOS) is described. Using several selected objects about the compass circle, telephotometer measurements of contrast ratio were taken atop the Exxon Building in downtown Houston. Continuous measurements of scattering coefficient were also made with an integrating nephelometer at an outlying site. Both telephotometer and nephelometer measurements were reduced to visual range and reported in the DAROAD format for inclusion in the HAOS Data Archive. GRA

N79-14624# Enviro Control, Inc., Rockville, Md.
CRITICAL REVIEW OF ESTIMATING BENEFITS OF AIR AND WATER POLLUTION CONTROL Final Report
A. Hershaft, A. M. Freeman, III, T. D. Crocker, and J. B. Stevens Jun. 1978 196 p refs
(Contract EPA-68-01-2821)
(PB-285555/9; EPA-600/5-78-014) Avail: NTIS
HC A09/MF A01 CSCL 13B

Three independent critiques by three experts of benefit assessment methodologies are presented. Specific aspects discussed include the nature and role of benefits, damage functions, valuation of effects, aggregation of results, and representation of uncertainties. The conceptual foundations of estimating pollution control benefits are presented and compared with empirical studies. It was concluded that while available estimates often do not adequately reflect the state-of-the-art, estimates of pollution control benefits would potentially be very useful to decision makers. The conceptual basis provided by economic theory for benefit estimation is adequate in most respects and far ahead of the corresponding empirical effort. A number of studies are guilty of failing to list explicitly critical assumptions or to express adequately uncertainty in the results, while other studies have employed conceptual models that are inappropriate to the problem at hand or the available data. Damage functions underlying benefit estimates are frequently based on insufficient data and/or inadequate characterization of exposure and effects. GRA

N79-14625# Fish and Wildlife Service, Harpers Ferry, W. Va. Eastern Energy and Land Use Group.
METHODS FOR THE ASSESSMENT AND PREDICTION OF MINERAL MINING IMPACTS ON AQUATIC COMMUNITIES: A REVIEW AND ANALYSIS. WORKSHOP PROCEEDINGS
William T. Mason, Jr. Apr. 1978 161 p refs Workshop held at Harpers Ferry, W. Va., 6-7 Dec. 1977
(PB-285422/2; FWS/OBS-78/30) Avail: NTIS
HC A08/MF A01 CSCL 13B

The proceedings are intended to promote uniformity and quality for environmental impact studies related to eastern U.S. minerals development. GRA

N79-14626# California Inst. of Tech., Pasadena. Dept. of Environmental Health Engineering.
MASS BALANCE DETERMINATIONS FOR POLLUTANTS IN URBAN REGIONS. METHODOLOGY WITH APPLICATIONS TO LEAD, ZINC, CADMIUM, AND ARSENIC
Aug. 1978 126 p refs
(Contract EPA-68-03-4034)
(PB-286241/5; EPA-600/4-78-046) Avail: NTIS
HC A07/MF A01 CSCL 13B

A methodology is presented for constructing mass balances for pollutants which move interactively through the air, land and water of an urban-industrial region. Results are reported for lead, zinc, cadmium, and arsenic based on experiments conducted specifically for this study, and on available data from the open literature. The principle on which the analysis is based is the conservation of mass equation for a given chemical element. A chemical element balance is used as in flow diagrams for the movement of pollutants through the environment. Rates of flow and accumulation can be estimated for the separate environmental compartments. GRA

N79-14627# Cambridge Systematics, Inc., Mass.
IMPLEMENTATION AND ADMINISTRATION OF AIR QUALITY TRANSPORTATION CONTROLS: AN ANALYSIS OF THE DENVER, COLORADO AREA Final Report, Jun. 1976 - Jul. 1978
J. H. Suhrbier, E. A. Deakin, L. A. Neumann, C. R. Kern, W. P. Stern, A. B. Rappaport, and G. Harvey Apr. 1978 608 p refs Sponsored in part by EPA
(Contract DOT-OS-60173)
(PB-286353/8; DOT-P-78-001) Avail: NTIS
HC A99/MF A01 CSCL 13B

The costs and benefits associated with the implementation and administration of transportation air quality measures required under the Clean Air Act were studied using the Denver Air Quality Control Region as a case example. The problems encountered by a number of metropolitan areas in their efforts to implement EPA Transportation Control Plans (TCP's) are discussed. Program measures examined are vehicle inspection and maintenance, ride sharing, preferential treatment for high occupancy vehicles, parking management, bicycling and transit. Impacts are described on legal and institutional considerations, urban economics, public administration, zoning, land management, travel behavior and conditions, motor vehicle regulation, capital enforcement costs, air quality, energy and safety. Emphasis is placed on the particular groups of institutions affected and on determination of relative importance of various costs and benefits associated with implementation. GRA

N79-14628# California Univ., Berkeley. Lawrence Berkeley Lab.
AEROSOL ANALYSIS FOR THE REGIONAL AIR POLLUTION STUDY Interim Report, 1 Jan. - 31 Dec. 1976
F. S. Goulding, J. M. Jaklenic, and B. W. Loo Jul. 1978 53 p
(PB-285681/3; EPA-600/4-78-034) Avail: NTIS
HC A04/MF A01 CSCL 14B

An aerosol sampling and analysis program was conducted as part of the Regional Air Pollution Study in St. Louis. Ten automatic dichotomous samplers were operated in the field for two years and collected 35,000 samples. The procedures used for analyzing these samples for total mass and elemental composition are described. The characteristics of the beta gauge mass measurement and energy dispersive X-ray fluorescence

analyses are discussed, together with the factors that affect the precision and accuracy of the data. GRA

N79-14629# Naval Research Lab., Washington, D. C.
PORTABLE VACUUM X-RAY SPECTROMETER INSTRUMENT FOR ON-SITE ANALYSIS OF AIRBORNE PARTICULATE SULFUR AND OTHER ELEMENTS Final Report
J. V. Gilfrich and L. S. Birks Jun. 1978 27 p refs
(PB-285678/9; EPA-600/7-78-103) Avail: NTIS HC A03/MF A01 CSCL 14B

A portable vacuum wavelength-dispersive X-ray analyzer was constructed for on-site measurement of the sulfur content of filter-deposited airborne particles. Although designed to analyze for sulfur, the spectrometer is adjustable over a limited range providing the potential for determining other elements. With the X-ray tube rated at 50 watts, the instrument achieves a 100-second 3 sigma detection limit for sulfur of better than 0.5 microgram/sq cm. GRA

N79-14630# Rockwell International Corp., Creve Couer, Mo.
AMBIENT PEROXYACETYL NITRATE (PAN) MEASUREMENTS IN THE HOUSTON AREA Final Report, 15 Jun. 1977 - 31 Oct. 1977
Robert T. Jorgen Jun. 1978 68 p refs Prepared for Radian Corp., Austin, Tex.
(PB-285550/0; AMC-54023.11-FR; HAOS-08) Avail: NTIS HC A04/MF A01 CSCL 14B

Peroxyacetyl nitrate was monitored at each of three (3) designated sites in Houston using automated gas chromatographs equipped with electron capture detectors. A rigorous quality assurance program was maintained during the course of the study. Data retrieval rates were generally good throughout the study. Overall data capture after validation was 92% of all possible observations during the period with individual site rates of 87%, 94%, and 97%. GRA

N79-14631# Rockwell International Corp., Creve Couer, Mo. Air Monitoring Center.
AMBIENT OZONE, OXIDANTS, AND NITROGEN OXIDES MEASUREMENTS IN THE HOUSTON AREA Final Report, 15 Jun. 1977 - 31 Oct. 1977
Robert T. Jorgen May 1978 96 p refs Prepared for Radian Corp., Austin, Tex.
(PB-285549/2; AMC-54023.1-FR) Avail: NTIS HC A05/MF A01 CSCL 14B

Total oxidant was monitored at each of three designated sites in Houston; ozone and oxides of nitrogen were monitored at a rural site northwest of Houston; and ozone was monitored at an offshore platform southeast of Houston in the Gulf of Mexico. A rigorous quality assurance program was maintained during the course of the study. Data retrieval rates were generally good throughout the study. Overall data capture after validation was 91% of possible hours with individual site rates of 96%, 89%, 94%, 89%, and 92%. GRA

N79-14632# Environmental Research Lab., College, Alaska. Arctic Environmental Research Station.
RESEARCH ON CONTROL TECHNOLOGY FOR ICE FOG FROM MOBILE SOURCES
Harold J. Coutts and Ronald K. Turner May 1978 98 p refs
(PB-285611/0; EPA-600/3-78-055) Avail: NTIS HC A05/MF A01 CSCL 13F

Automotive generated ice fog is a form of air pollution that results when exhaust water vapor freezes into minute particles which form a dense fog. The major control technique evaluated was cooling the exhaust gases to well below the dew point, thus condensing water vapor into a liquid stream before final discharge. During the winters of 1974-75 and 1975-76 the Arctic Environmental Research Station evaluated 12 cooler condensers on nine inservice vehicles. It was found that ice film formation decreased heat transfer efficiency. An ice fog mass emission reduction up to 80 percent was attained with cooler condensers on motor vehicles. GRA

N79-14633# Acurex Corp., Mountain View, Calif.
EMISSION CHARACTERIZATION OF STATIONARY NOx SOURCES. VOLUME 2: DATA SUPPLEMENT
K. G. Salvesen, M. Herther, K. J. Wolfe, and E. Chu Aug. 1978 286 p
(Contract EPA-68-02-2160)
(PB-285429/7; EPA-600/7-78-120B-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 13B

The environmental assessment of stationary source NOx combustion modification technologies program has two main objectives: (1) to identify the multimedia environmental impact of stationary combustion sources and NOx combustion modification controls: and (2) to identify the most cost-effective, environmental sound NOx combustion modification controls for attaining and maintaining current and projected NO2 air quality standards to the year 2000. Data presented include: regional fuel consumption tables for 1974; national fuel consumption tables for 1985 and 2000; national criteria pollutant emissions for 1974; national emissions inventory for 1974; regional stationary source combustion controls; national source pollution potential assessment for 1974; pollution potential summaries for the energy projection scenarios in 1985 and 2000; and pollution potential trends to the year 2000 for the energy projection scenarios. GRA

N79-14634# Monsanto Research Corp., Dayton, Ohio.
SOURCE ASSESSMENT: PRIORITIZATION OF STATIONARY WATER POLLUTION SOURCES Final Report, Aug. 1976 - Sep. 1977
R. B. Reznik, E. C. Eimutis, J. L. Delaney, S. R. Archer, and J. C. Ochsner Jul. 1978 137 p refs
(Contract EPA-68-02-1874)
(PB-285421/4; MRC-DA-710) Avail: NTIS HC A07/MF A01 CSCL 13B

Priority lists to aid in selecting specific sources of water effluents for detailed assessment are presented. The general water prioritization model and its implementation are described and gives a detailed example of its use. Various industries (source types) were rank-ordered (prioritized) on the basis of their water discharges. Solid residues were assumed to contribute to water discharges as leachates or water runoff. The prioritization index for water, termed the impact factor is based on a ratio of actual to hazardous effluent mass. The water discharge prioritization model was applied to 262 stationary organic and inorganic sources. The source types were also divided into four subcategories (petrochemicals, textiles, pesticides, and fertilizers) and prioritized. GRA

N79-14635# Monsanto Research Corp., Dayton, Ohio.
SOURCE ASSESSMENT: WATER POLLUTANTS FROM COAL STORAGE AREAS Final Report, Nov. 1976 - Dec. 1977
R. A. Wachter and T. R. Blackwood May 1978 123 p refs
(Contract EPA-68-02-1874)
(PB-285420/6; MRC-DA-748; EPA-600/2-78-004M) Avail: NTIS HC A06/MF A01 CSCL 13B

Water pollution levels that result from coal stockpiles maintained outdoors were studied. A representative source was defined to characterize the pollution levels. Effluent data was obtained by placing coals, collected from various regions in the U.S., under a rainfall simulator. Drainage samples were analyzed for water quality parameters, organic and inorganic substances, and pollutants covered by effluent limitations. Coal drainage effluent concentrations, rates, and factors were determined. Hydrologic relationships were used to calculate the diluted concentrations entering a waterway. The ratio of this level to water quality criteria was determined as an indication of the potential environmental impact. GRA

N79-14636# GEOMET, Inc., Gaithersburg, Md.
THE GEOMET INDOOR-OUTDOOR AIR POLLUTION MODEL
Demetrios Moschandreas and John W. C. Stark Jun. 1978 64 p refs Prepared for HUD
(Contract EPA-68-02-2294)
(PB-285706/8; GEOMET-EF-628; EPA-600/7-78-106) Avail: NTIS HC A04/MF A01 CSCL 13B

The model estimates indoor air pollutant concentrations as a function of outdoor pollutant levels, indoor pollutant generation sources rates, pollutant chemical decay rates, and air exchange rates. Topics discussed include basic principles, model formulation, parameter estimation, model statistical validation, and model

sensitivity to perturbations of the input parameters. The numerical estimates obtained from the GIOAP simulations have been validated with observed hourly pollutant concentrations obtained from an 18-mo residential air quality sampling program. Statistically the GIOAP model estimations are within 25% of the ideal condition (estimated and observed values coincide) for 85% of the observed values for CO, No, NO2, NMHC, and CO2. GRA

N79-14637# Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

SEARCH FOR NITRIFYING AGENTS IN WATER AND SOILS AS SOURCES OF NITRATES IN SURFACE WATER Final Report

Noel A. Phillips and Robert L. Todd Feb. 1978 98 p refs
Prepared in cooperation with Georgia Univ., Athens
(Contract DI-14-34-0001-6011)
(PB-285700/1; ERC-02-78; W78-11063; OWRT-A-066-GA(1)) Avail: NTIS HC A05/MF A01 CSCL 13B

The soil and surrounding water of seventeen diverse types of watersheds were analyzed over a one-year sampling period for a variety of parameters. Terrestrial nitrifying populations were quantified. Concentrations of ammonia, nitrate, and total nitrogen and pH were measured from soil extracts. The water was analyzed for concentrations of nitrate, ammonia, and seven selected cations. The terrestrial nitrifying bacteria were positively correlated to nitrate and cation loss from so-called natural systems, i.e., ones that were not fertilized. The average concentration of nitrate-nitrogen lost from natural systems was 0.47 mg/l over the year. Loss from the fertilized systems averaged 0.47 mg/l, approximately a 7-fold increase. GRA

N79-14638# Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.

IMPLEMENTATION OF AGRICULTURAL SALINITY CONTROL TECHNOLOGY IN GRAND VALLEY Final Report

Robert G. Evans, Wynn R. Walker, Gaylord V. Skogerboe, and Charles W. Binder Jul. 1978 211 p refs
(Grant EPA-S-802985)
(PB-286510/3; EPA-600/2-78-160) Avail: NTIS HC A10/MF A01 CSCL 02C

The results of applied research on salinity control of irrigation return flows in the Grand Valley of Colorado are summarized for the period of 1969 to 1976. Salinity and economic impacts are described for the Grand Valley Salinity Control Demonstration Project which contains approximately 1,600 hectares and involves most of the local irrigation companies in the Valley. During the eight years of the demonstration project, 12.2 km of canals were lined, 26.54 km of laterals were lined, 16,400 meters of drainage tile were installed, a wide variety of on-farm improvements were constructed, and an irrigation scheduling program was implemented. On-farm improvements evaluated were solid-set sprinklers, side-roll sprinklers, drip (trickle) irrigation, furrow irrigation, and automatic cut-back furrow irrigation. The total improvements resulted in a salt reduction of 12,300 metric tons per year reaching the Colorado River. This salt reduction results in an annual benefit to downstream water users of nearly $2,000,000. GRA

N79-14639# Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.

EVALUATION OF IRRIGATION METHODS FOR SALINITY CONTROL IN GRAND VALLEY Final Report

Robert G. Evans, Wynn R. Walker, Gaylord V. Skogerboe, and Stephen W. Smith Jul. 1978 189 p refs
(Grant EPA-S-802985)
(PB-286511/1; EPA-600/2-78-161) Avail: NTIS HC A09/MF A01 CSCL 02C

The implementation of on-farm salinity control alternatives was emphasized; primarily evaluating irrigation scheduling, furrow irrigation, sprinkler irrigation, and trickle irrigation. Border irrigation was also evaluated, but was not implemented as part of this study. The cost-effectiveness of the various on-farm alternatives in the Grand Valley is summarized and presented. GRA

N79-14640# Colorado State Univ., Fort Collins. Dept. of Agriculture and Chemical Engineering.

BEST MANAGEMENT PRACTICES FOR SALINITY CONTROL IN GRAND VALLEY Final Report

Wynn R. Walker, Gaylord V. Skogerboe, and Robert G. Evans Jul. 1978 128 p refs
(Grant EPA-S-802985)
(PB-286512/9; EPA-600/2-78-162) Avail: NTIS HC A07/MF A01 CSCL 02C

A nontechnical summary of several research activities in the Grand Valley is given. Analyses of alternative measures of reducing the salt load originating from the Valley as a result of irrigation return flows are presented. These alternatives include conveyance channel linings, field relief drainage, on-farm improvements (such as irrigation scheduling, head ditch linings, sprinkler and trickle irrigation), economic control measures such as taxation and land retirement, modified legal constraints, and collection and treatment of return flows with desalting systems. The best management practices for salinity control in the Grand Valley should be primarily the structural rehabilitation and operational modification of the local irrigation system lying below the turnouts from the major canal systems. Canal linings appear in the optimal strategies at higher levels of valleywide salinity control emphasis but only so far as lining the Government Highline Canal is concerned. Desalting would become a cost-effective alternative after major irrigation system improvements are implemented. GRA

N79-14641# PEDCO-Environmental Specialists, Inc., Cincinnati, Ohio.

AIR QUALITY ASSESSMENT OF PARTICULATE EMISSIONS FROM DIESEL-POWERED VEHICLES Final Report

Terrence Briggs, Jim Throgmorton, and Mark Karaffa Mar. 1978 157 p refs
(Contract EPA-68-92-2515)
(PB-286172/2; EPA-450/2-78-038) Avail: NTIS HC A08/MF A01 CSCL 13B

Estimates of the impact projected diesel-powered vehicle sales will have on the levels of total suspended particulates (TSP) and benzo(a)pyrene (BaP) to which the population is exposed are presented. A detailed particulate emission inventory is developed for a representative test city (Kansas City, MO) for a base year (1974). Emissions and population exposure to TSP & BaP are projected for 1981, 1983, 1985, and 1990. Emissions from all sources except diesel are assumed to remain constant in order that the full impact of diesels can be seen and because insufficient time was available to vary the model. An abbreviated discussion of possible health effects attributable to organic emissions from diesel powered vehicles is included. GRA

N79-14642# URS Research Co., San Mateo, Calif.

CLEANUP EFFICIENCY AND BIOLOGICAL EFFECTS OF A FUEL OIL SPILL IN COLD WEATHER: THE 1977 BOUCHARD NO. 65 OIL SPILL IN BUZZARDS BAY, MASSACHUSETTS Final Report, Jun. 1977 - Jan. 1978

Eric Schrier Jul. 1978 203 p refs
(Contract EPA-68-03-2160)
(PB-286362/9; URS-7004-05-01; EPA-600/7-78-133) Avail: NTIS HC A10/MF A01 CSCL 13B

The techniques used to clean up and/or mitigate damage from the spill were evaluated. Recommendations of feasible alternative methods that may be used in future spills in similar environmental conditions are given. The environmental damage caused by the spill is described. Because of the unusual ice and weather conditions at Buzzards Bay during and after the spill, much of the cleanup effort relied on methods and equipment rarely used before. Modifications of existing techniques are necessary if future spills in similar conditions are to be treated more successfully. Unlike previous No. 2 spills in the bay, acute biological effects were not observed. Severe biological damage was probably prevented by the entrapment of oil in both shore-fast and free-flowing ice. GRA

N79-14643# Monsanto Research Corp., Dayton, Ohio.

ENERGY REQUIREMENTS OF PRESENT POLLUTION CONTROL TECHNOLOGY Final Report, 4 Mar. - 30 Jun. 1976

R. W. Serth May 1978 103 p refs
(Contract EPA-68-02-1320)
(PB-286231/6; MRC-DA-762; EPA-600/7-78-084) Avail: NTIS HC A06/MF A01 CSCL 13B

Estimates of energy requirements for pollution control at

stationary sources in the United States, as compiled from the literature, are presented and discussed. The data are analyzed to determine the distribution of energy requirements among economic sectors and among pollutant types. Alternative methods of pollution control that are potentially less energy intensive and still capable of meeting environmental regulations are also discussed. GRA

N79-14644# Boeing Commercial Airplane Co., Seattle, Wash.
AIRCRAFT INDUSTRY WASTEWATER RECYCLING
A. K. Robinson and D. F. Sekits Jun. 1978 103 p
(Grant EPA-S-803073)
(PB-286210/0; EPA-600/2-78-130; D6-42205-4) Avail: NTIS HC A06/MF A01 CSCL 13B

The feasibility of recycling certain categories of water used in the manufacture of airplanes was demonstrated. Water in four categories was continuously recycled in 380-liter (100-gallon) treatment plants; chemical process rinse water, dye-penetrant crack-detection rinse water, electroplating process rinse water containing cyanides, and machine shop water-based coolant. The estimated capital cost was $3.4 million for equipment to recycle the above categories of water in a typical, medium-sized airplane factory generating 1.5 Ml (400,000 gal)/day. Recycling costs were estimated to be: $0.94/kl ($3.57/1000 gal) for chemical process rinse water; $1.65/kl ($6.25/1000 gal) for dye penetrant rinse water; $4.36/kl ($16.50/1000 gal) for cyanide process rinse water; and $12.18/kl ($12.18/kl ($46.09/1000 gal) for machine shop coolant. GRA

N79-14645# World Health Organization, Manila (Philippines). Regional Office for the Western Pacific.
WATER QUALITY MONITORING: PHILIPPINES, REPUBLIC OF KOREA, JAPAN, MALAYSIA, NEW ZEALAND, AUSTRALIA, GUAM Assign Report, 15 Sep. - 28 Nov. 1977
Robert L. Fox, Jr. 24 Feb. 1978 52 p refs Sponsored in part by United Nations Environment Programme, Nairobe, Kenya
(PB-286204/3) Avail: NTIS HC A03/MF A01 CSCL 13B

The basic groundwork for country participation in a global fresh water monitoring project sponsored by UNEP/UNESCO/WHO/WMO was established. The project complements the existing global air quality monitoring project in providing an earth watch network under the Global Environment Monitoring System (GEMS). Visits were made to seven participating countries to: (a) provide expert advice by reviewing present water quality monitoring programs in selected member countries; and (b) assist in establishing programs in conformity with the GEMS project, covering the following elements; (1) site selection, water quality sampling and hydrological gauging; (2) parameters for monitoring; (3) analytical methods, including laboratory quality assurance; (4) water quality data handling systems; (c) assist in preparing national cooperative project structures, based on the above.GRA

N79-14646# Pacific Environmental Services, Inc., Santa Monica, Calif.
EVALUATION OF HYDROCARBON EMISSIONS FROM PETROLEUM LIQUID STORAGE
P. R. Peterson, P. S. Bakshi, A. Kokin, and L. Norton Mar. 1978 138 p refs
(Contract EPA-68-02-2606)
(PB-286190/4; EPA-450/3-78-012) Avail: NTIS HC A07/MF A01 CSCL 13B

An estimate of 1976 nationwide hydrocarbon emissions from storage of petroleum liquids in existing tanks with a capacity greater than 150,000 liters is provided. Numbers and types of existing tanks were determined to estimate these emissions by geographical location, industry sector, and volatility class of the stored products. Projections of emissions are made for 1980 and 1985 assuming only newly constructed tanks meet the requirements of the New Source Performance Standard (NSPS) for the storage of petroleum liquids and then assuming existing fixed roof tanks storing products with a volatility greater than 10.5 kPa are retrofitted with internal floating covers. A nationwide estimate of 1976 emissions by petroleum liquid type stored is presented. GRA

N79-14647# Environmental Research Lab., Gulf Breeze, Fla.
AMERICAN-SOVIET SYMPOSIUM ON THE BIOLOGICAL EFFECTS OF POLLUTION ON MARINE ORGANISMS Final Report
Thomas W. Duke and Anatoliy I. Simonov May 1978 176 p refs Symp. held at Gulf Breeze, Fla., 20-24 Sep. 1976
(PB-285923/9; EPA-600/9-78-007) Avail: NTIS HC A09/MF A01 CSCL 06F

American and Soviet specialists discuss state-of-the-art for hydrobiological analysis of basic structural components of marine ecosystems and the influence of various pollutants on these components. Participants define problems related to methods for modeling the influence of pollutants on the marine environment, long-term forecasting and determination of permissible loads of pollutants, and the unification and intercalibration of methods for determining production of micro-organisms of ocean bacterioplankton and phytoplankton. Results or laboratory research on the influence of pollution on the marine environment are presented. GRA

N79-14648# Environmental Protection Agency, Ann Arbor, Mich. Standards Development and Support Branch.
REVIEW OF PAST STUDIES ADDRESSING THE POTENTIAL IMPACT OF CO, HC, AND NOx EMISSIONS FROM COMMERCIAL AIRCRAFT ON AIR QUALITY
Philip Lorang Mar. 1978 73 p refs
(PB-286421/3; AC-78-03) Avail: NTIS HC A04/MF A01 CSCL 01C

Partial documentation of EPS's review of past air quality studies is presented. A review of air quality justifications for the commercial aircraft emission standards contained in the NPRM is also given. GRA

N79-14649# California Inst. of Tech., Pasadena. W. M. Keck Lab of Hydraulics and Water Resources.
MATHEMATICAL MODEL FOR MULTIPLE COOLING TOWER PLUMES Final Report
Frank H. Y. Wu and Robert C. Y. Koh Jun. 1978 133 p refs
(Grant EPA-R-803989-01-1)
(PB-286364/5; EPA-600/7-78-102) Avail: NTIS HC A07/MF A01 CSCL 04A

A mathematical model was developed for the prediction of plume properties, such as excess plume temperature, humidity and liquid phase moisture (water droplet), plume trajectory, width, and dilution at the merging locations and the beginning and ending points of the visible part of the plumes. Detailed printout and contour plots of excess temperature and moisture distribution can also be obtained if desired. Based on comparison with laboratory data, this model gave good predictions for the case of dry plumes (no moisture involved). GRA

N79-14650# Idaho National Engineering Lab., Idaho Falls.
AN ATMOSPHERIC TRITIUM AND CARBON-14 MONITORING SYSTEM
J. L. Thompson (Idaho State Univ.), S. W. Duce, and J. J. Keller Sep. 1978 22 p refs
(Contract EY-76-C-07-1570)
(PB-287502/9; NUREG-CR-0386) Avail: NTIS HC A02/MF A01 CSCL 18D

Atmospheric monitoring of gaseous 3H and 14C in and around nuclear facilities is of interest because these nuclides may contribute to the environmental dose commitment. A sampling system has been designed to measure 3H and 14C at concentrations on the order of 0.0000 01 pCi/cc of air. This system, which may run unattended for periods up to two weeks at a controlled flow of 80 cc/min is small, portable, and only requires electrical power. The air sample is pulled through silica gel and molecular sieve adsorbent columns at a rate determined by small orifices. Part of the air stream passes through a heated catalytic oxidizer prior to the adsorbent columns. The adsorbent columns are returned to the laboratory for analysis. Tritium is counted at HTO, and 14C as CO2, by liquid scintillation techniques. The analysis reveals the concentration of these radionuclides originally present as HTO and CO2, as well as the concentration in other forms which are oxidizable to these species. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N79-14651*# Institute for Atmosphere Optics and Remote Sensing, Hampton, Va.

A COMPARATIVE STUDY OF CONROY AND MONTE CARLO METHODS APPLIED TO MULTIPLE QUADRATURES AND MULTIPLE SCATTERING Final Report

Adarsh Deepak and Alexander Fluellen (Clark Coll.) Washington NASA Dec. 1978 28 p refs

(Contract NAS1-15198)

(NASA-CR-3059) Avail: NTIS HC A03/MF A01 CSCL 04A

An efficient numerical method of multiple quadratures, the Conroy method, is applied to the problem of computing multiple scattering contributions in the radiative transfer through realistic planetary atmospheres. A brief error analysis of the method is given and comparisons are drawn with the more familiar Monte Carlo method. Both methods are stochastic problem-solving models of a physical or mathematical process and utilize the sampling scheme for points distributed over a definite region. In the Monte Carlo scheme the sample points are distributed randomly over the integration region. In the Conroy method, the sample points are distributed systematically, such that the point distribution forms a unique, closed, symmetrical pattern which effectively fills the region of the multidimensional integration. The methods are illustrated by two simple examples: one, of multidimensional integration involving two independent variables, and the other, of computing the second order scattering contribution to the sky radiance. S.B.S.

N79-14652# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

WAVELIKE SPATIAL STRUCTURES IN RED (LAMBDA = 6300 A) LINE NIGHTGLOW INTENSITY AT 22 DEG 41 MINUTES SOUTH OF 45 DEG 00 MINUTES, BRAZIL

Jose Humberto A. Sobral, Mangalathayil A. Abdu, and Inez S. Batista Nov. 1978 23 p refs

(INPE-1389-PE/181) Avail: NTIS HC A02/MF A01

Dynamic processes of the nighttime ionosphere over Cachoeira Paulista, Brazil, are discussed based on recent data of the OI 6300 A nightglow and ionosonde measurements, both obtained at that site. The 6300 A photometer scanned the zenith angle range of 75 deg south and along the geomagnetic meridional plane over Cachoeira Paulista (with no azimuthal scanning). Some nights presented remarkable wavelike structures on the meridional profiles of the red line intensity which occurred essentially during the premidnight period. According to the set of results presented such a set of time and space patterns of the OI 6300 deg A intensity present wavelengths of the order of a few hundred kilometers and propagate from north to south at an average speed of 238 m/s + or - 73 m/s, assuming the emitting layer at an altitude of 250 km. An attempt is made to associate such north to south travelling enhancements of the OI 6300 deg A emission with gravity waves. Comments are also made on the behavior of the red line emission during the post midnight period. J.M.S.

N79-14653# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

NITRIC OXIDE HEIGHT DISTRIBUTION IN THE LOWER IONOSPHERE FROM ROCKET ION COMPOSITION RESULTS OVER A SOUTHERN TEMPERATE LATITUDE STATION

M. A. Abdu and Inez S. Batista Nov. 1978 23 p refs

(INPE-1394-PE/185) Avail: NTIS HC A02/MF A01

Ion composition results obtained by Narcisi et al. from rocket observations carried out during the November 1966 solar eclipse campaign at Cassino, south Brazil, are analysed on the basis of the presently known detailed ion chemistry of the lower ionosphere, to deduce the height distribution of nitric oxide concentration in the region from 80 to 110 km. The results are compared with other available experimental determinations of the NO height distributions using rocket borne radiometric measurement of NO gamma band emissions in the day glow. S.E.S.

N79-14654# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SIMULTANEOUS OBSERVATIONS OF SODIUM DENSITY AND THE NaD, OH (8,3) AND OI 5577 A NIGHTGLOW EMISSIONS

B. R. Clemesha, V. W. J. H. Kirchhoff, D. M. Simonich, H. Takahashi, and P. P. Batista Dec. 1978 27 p refs

(INPE-1404-PE/187) Avail: NTIS HC A03/MF A01

Simultaneous observations of the vertical distribution of sodium density and the intensities of the OI 5577 deg A, NaD, and OH (8,3) airglow emissions are reported. It is shown that the nocturnal variations of the emissions are well correlated with those of the sodium at 91 km, 87 km, and 84 km respectively. The correlated variations are caused by atmospheric waves having vertical wavelengths between 10 km and 15 km, and whose phase propagates downwards with velocities between 1 km/hr and 2 km/hr. Enhanced sodium density is observed on days of exceptionally high OH (8,3) band rotational temperature. The amplitude of the correlated nocturnal variations in sodium density on the bottomside of the layer is normally too large to be explained as the direct result of atmospheric density changes. Large nocturnal changes in sodium density are seen to be closely correlated with changes in rotational temperature, suggesting that the changes were caused by a temperature dependence of the appropriate rate coefficients. J.M.S.

N79-14655# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A DIAGNOSTIC STUDY OF GEOPOTENTIAL FIELD OBTAINED FROM EQUILIBRIUM EQUATIONS M.S. Thesis [UM ESTUNDO DIAGNOSTICO DO CAMPO DE GEOPOTENCIAL OBTIDO DA EQUACAO DE BALANCO]

Wolodymir Boraszewski Nov. 1978 189 p refs In PORTUGUESE; ENGLISH summary

(INPE-1400-TPT/103) Avail: NTIS HC A09/MF A01

The balance equation is solved numerically for geopotential, over a spherical grid between the latitude of 10 degrees N and 35 degrees S and longitude 35 degrees W and 70 degrees W, with geopotential prescribed at the boundaries and with winds prescribed over the region. The geopotential in the interior of the region is obtained as a sum of 5 parts each corresponding to forcing terms of the balance equation. The cumulative values of the geopotential thus obtained are compared with the field of geopotential as read from the charts, and the consistency of the fields in the horizontal, vertical and, with time, was analyzed. In addition, the difficulties in obtaining the stream function (given the geopotential) are discussed. Author

N79-14656*# Lamont-Doherty Geological Inst., Palisades, N. Y.

ANALYSIS AND GEOLOGICAL INTERPRETATION OF GRAVITY DATA FROM GEOS-3 ALTIMETER Final Report, May 1978

M. Talwani, A. B. Watts, and M. E. Chapman Dec. 1978 171 p

(Contract NAS6-2519)

(NASA-CR-156849) Avail: NTIS HC A08/MF A01 CSCL 08G

A number of detailed gravimetric geoids of portions of the world's oceans from marine gravity measurements were constructed. The geoids were constructed by computing 1 x 1 deg or 10 x 10 deg averages of free-air anomaly data and subtracting these values from currently used satellite derived Earth models. The resulting difference gravity anomalies are then integrated over a sphere using a simplified form of Stoke's equation to obtain a difference geoid. This difference geoid is added to the satellite derived model to obtain a 1 x 1 deg or 10 x 10 deg total gravimetric geoid. The geoid undulations are studied by comparison of the altimeter measurements with the morphology of the ocean floor. Utilizing a combination of altimetry data, gravity and seismic reflection data, geophysical models of the earth can be constructed. F.O.S.

N79-14657*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

ON THE DETERMINATION AND INVESTIGATION OF T

TERRESTRIAL IONOSPHERIC REFRACTIVE INDICES USING GEOS-3/ATS-6 SATELLITE-TO-SATELLITE TRACKING DATA Final Report
Anthony S. Liu Nov. 1978 30 p refs Sponsored by NASA
(NASA-CR-156848) Avail: NTIS HC A03/MF A01 CSCL 04A

When the radio link between two satellites (GEOS-3/ATS-6) is intercepted by the earth's ionosphere and neutral atmosphere, a change in the Doppler frequency results. Travel through the atmosphere causes the Doppler phase to be advanced in the ionosphere's portion and retarded in the neutral portion of the atmosphere. Analysis of the shortening and lengthening of the phase of the Satellite-to-Satellite Tracking (SST) data that passed within 40-700 km above the earth's surface during its ATS-6 to GEOS-3 to ATS-6 path, caused by the atmosphere, results in refractivity versus height profiles. The SST Doppler data were used directly to adjust the GEOS-3 orbit. Perturbation from the Moon, Sun and a 15th order/degree earth gravity field were included in the orbit solution. This orbit was continued through the occultation period and a model ionosphere was estimated by a least-square adjustment of the Chapman ionosphere parameters from the SST data residuals. The refractivity profile obtained by this model ionosphere was compared to a refractivity profile obtained by a direct integral inversion of the SST data residuals. Systematic differences between the 2 methods were caused by orbital errors, which propagated into the solution. The SST data yielded refractive index profiles in a novel economical manner because no additional or special on-board equipment were required. Author

N79-14658# Hycor, Inc., Woburn, Mass.
HIGH ALTITUDE SMOKE PROGRAM (HASP) Final Report, 4 Feb. 1977 - 31 May 1978
L. James Larson 31 May 1978 23 p
(Contract F19628-77-C-0136)
(AD-A059734; AFGL-TR-78-0147) Avail: NTIS HC A02/MF A01 CSCL 04/2

Two (2) dispensers for high altitude (=85,000 ft.) release of smoke puffs were designed, developed and flight tested in support of Air Force Geophysics Lab stratospheric turbulence studies. Each self-contained dispenser provided environmental protection and sequentially ejected six (6) smoke puff canisters containing equal weights of TiCl4 and a 50/50 Water-Methanol mixture. Canisters were functioned 100 feet below the balloon platform via a tethered lanyard. Author (GRA)

N79-14659# Boston Coll., Chestnut Hill, Mass.
GEOKINETIC ENVIRONMENT STUDIES Final Report, 1 Jul. 1976 - 30 Sep. 1977
Carl R. Syverson, Joseph I. Blaney, Jr., Eugene B. Hartnett, and Carlton E. Molineux May 1978 126 p ref
(Contract F19628-76-C-0007; AF Proj. 7628)
(AD-A059387; AFGL-TR-78-0124) Avail: NTIS HC A07/MF A01 CSCL 08/11

The Stand-Alone Data Acquisition System is described. Microcomputer controlled data acquisition programming and electronics are detailed. Instrumentation and recording of geokinetic data generated by a Titan III-D launch at Vandenberg Air Force Base is described. Interfacing and programming in support of the collection of geokinetic and inertial data in a Minuteman test silo at Hill Air Force Base are described.
Author (GRA)

N79-14660# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
HETEROGENEOUS DECOMPOSITION OF OZONE ON SULFURIC ACID SURFACES AT STRATOSPHERIC TEMPERATURES Final Report, 28 Jun. 1976 - 27 Jun. 1977
Alan B. Harker Sep. 1977 32 p refs
(Contract DOT-TSC-1202)
(AD-A051504; SC5078.18FR; FAA-AEQ-77-12) Avail: NTIS HC A02/MF A01 CSCL 07/2

Methods of forming sulfuric acid aerosols at stratospheric temperatures were investigated, and the rate constant for the heterogeneous decomposition of ozone on sulfuric acid surfaces was determined over the temperature range 217 to 263K. The dependence of the decomposition rate constant on ozone concentration, relative humidity, and sulfuric acid surface area was studied and the data was interpreted in terms of the heterogeneous gas-surface kinetic model proposed by Judeikis and Siegel (1973). The role of heterogeneous reactions in the stratosphere is discussed, and recommendations for further experimental work are presented. GRA

N79-14661# Control Data Corp., Minneapolis, Minn. Research Div.
OZONE CONCENTRATION BY LATITUDE, ALTITUDE, AND MONTH, NEAR 80 W Final Report
R. W. Wilcox and A. D. Belmont 8 Aug. 1977 44 p refs
(Contract DOT-FA77WA-3999)
(AD-A046956; cFAA-AEQ-77-13) Avail: NTIS HC A03/MF A01 CSCL 04/1

To provide a convenient summary of presently available data on ozone concentrations, monthly and seasonal means and standard deviations of ozone are presented in latitude-height cross-sections and tables. Results are given in each of two units: micrograms per cubic meter, and parts per million by volume. Data are based on North American ozonesonde stations, 1962-75. Author (GRA)

N79-14662# SRI International Corp., Menlo Park, Calif.
DETERMINATION OF NO2 PHOTOLYSIS PARAMETERS FOR STRATOSPHERIC MODELING Final Report, Jul. 1976 - Jun. 1978
John E. Davenport Jun. 1978 43 p refs
(Contract DOT-TSC-1204)
(AD-A056843; FAA-EQ-78-05) Avail: NTIS HC A03/MF A01 CSCL 04/1

This study was undertaken to obtain photolysis parameters for the presence of NO2 + hnu yields NO + O, which could be supplied to the modeling of that region. The absolute absorption coefficients for NO2 were measured at 297, 247, 226, and 204 K and are tabulated at 1-nm intervals over the 390-420 nm photolysis cut-off region. Experimental uncertainties range from 2% at room temperature at 420 nm to 15% at 204 K, and mainly fall in the 4-7% range. GRA

N79-14663# Wyoming Univ., Laramie. Dept. of Physics and Astronomy.
INFLUENCE OF AEROSOLS ON ELECTRICAL PARAMETERS IN THE FREE ATMOSPHERE Interim Technical Report, Aug. 1977 - Aug. 1978
J. M. Rosen and D. J. Hofmann Aug. 1978 45 p refs
(Grant DAAG29-77-G-0046)
(AD-A060330; AP-43; ARO-14048.1-GS) Avail: NTIS HC A03/MF A01 CSCL 07/4

A force-ventilated device for measuring the small positive ion density from a rising balloon platform in the free atmosphere has been developed and tested on 6 flights. The data from individual soundings indicate that the instrument produces self consistent results but there appears to be long term trends of the apparent stratospheric ion density which may be associated with some unidentified variable. Author (GRA)

N79-14664# Air Force Geophysics Lab., Hanscom AFB, Mass.
DISSOCIATION DRIVEN DIURNAL OSCILLATIONS
S. P. Zimmerman and T. J. Keneshea 30 May 1978 15 p refs
(AF Proj. 6690)
(AD-A060252; AFGL-TR-78-0139; AFGL-ERP-634) Avail: NTIS HC A02/MF A01 CSCL 04/1

The use of a one-dimensional model atmosphere calculation incorporating dissociation of O2 and ionized species demonstrates that dissociation, through the production of atomic oxygen, can drive the vertical thermosphere and upper mesosphere into diurnal oscillations. It is further demonstrated that neutral mesospheric and lower thermospheric turbulence, through its control of atomic oxygen flow, can cause large amplitude variations of these oscillations. Author (GRA)

N79-14665# Utah State Univ., Logan.
ELECTRON DENSITY STRUCTURE IN BARIUM CLOUDS: MEASUREMENTS AND INTERPRETATION Final Report, 1 Jun. 1976 - 28 Feb. 1978
K. D. Baker, J. C. Ulwick, M. C. Kelley, L. C. Howlett, G. D.

Allred, N. Grossbard et al Feb. 1978 101 p refs
(Contract DNA001-76-C-0278)
(AD-A059922; AD-E300332; DNA-4561F) Avail: NTIS HC A06/MF A01 CSCL 04/1

Six instrumented rockets were used to probe three separate ion clouds that resulted from F-region barium releases, and measure electron density structure within the clouds. Two probes were launched into each of the three ion clouds, and each probe showed considerable enhancement in F-region electron density over the normal background levels. In four traversals the electron density exceeded 1,000,000/cu cm with a maximum of 5,000,000/cu cm observed in one case. Two showed dramatic structure in the electron density profiles associated with passage through striated portions of the cloud. These structures had spatial extent as measured by the rocket probes normal to the terrestrial magnetic field of hundreds of meters with the density changing by factors of from about 2 to 10 as the probes passed into and out of the structure. The change of density on some of the features had particularly fast drop off, corresponding to less than 20 meters travel normal to the magnetic field.
Author (GRA)

N79-14666# Dayton Univ. Research Inst., Ohio.
MODIFICATIONS TO THE 1972 ROBIN PROGRAM Final Report
Nicholas A. Engler and James K. Luers Jul. 1978 49 p refs
(Contract DAEA18-77-C-0008; DA Proj. 1L1-62111-AH-71)
(AD-A059930; ERADCOM/ASL/CR-0008-1) Avail: NTIS HC A03/MF A01 CSCL 04/1

The Robin system is used to derive density, temperature, pressure, and winds from the radar track of an inflatable falling sphere. The system consists of a rocket vehicle, sphere, radar, and software program utilized to process and derive the atmospheric parameters. The computer program (called ROBIN 72) used for the derivation of the data, was subjected to extensive field tests and has subsequently been modified. The new program resulting from the modifications (designated ROBIN 77) eliminates a number of problems encountered in the earlier version such as: supersonic bias, Mach one spike, Cd exceedance, and subsonic bias. The new program includes a better estimate of filter errors resulting from radar tracking errors. The 1976 US Standard Atmosphere replaced the 1962 US Standard Atmosphere for a first guess of temperatures used to calculate density. Rocketsonde-derived density errors due to radiosonde data are discussed and a summary of the accuracy of thermodynamic data and winds using the ROBIN 77 program is presented. Author (GRA)

N79-14667# Boston Univ., Mass. Dept. of Astronomy.
BEHAVIOR OF THE IONOSPHERIC F-REGION DURING GEOMAGNETIC STORMS: APPENDIX: TABULATED VALUES FOR AVERAGE AND MEDIAN STORM PATTERNS IN F-REGION PARAMETERS Final Scientific Report, 1 Sep. 1974 - 30 Sep. 1977
Michael Mendillo Mar. 1978 149 p
(Contract F19628-75-C-0044; AF Proj. 4643)
(AD-A059926; ACBU-SER-III-NO-7; AFGL-TR-78-0092(III)) Avail: NTIS HC A07/MF A01 CSCL 04/1

This report consists of an extensive set of Tables giving a statistical summary of ionospheric storm morphologies more fully discussed in the report Behavior of the Ionospheric F-Region During Geomagnetic Storms, Mendillo (1978), final contract report for AFGL/F-19628-75-C-0044. Author (GRA)

N79-14668# Ford Aerospace and Communication Corp., Newport Beach, Calif. Aeronautronic Div.
INFRARED ABSORPTION BY CO2 AND H2O Scientific Report, 4 Oct. 1976 - 4 Oct. 1977
David A. Gryvnak and Darrell Burch Hanscom AFB, Mass. AFCRL May 1978 60 p refs
(Contract F19628-76-C-0302; AF Proj. 7670)
(AD-A060079; U-6417; AFGL-TR-78-0154; SR-1) Avail: NTIS HC A04/MF A01 CSCL 04/1

Spectral transmission data for CO2 are presented between approximately 495 and 835/cm for a variety of samples of CO2 mixed in dry air. Sample parameters cover a wide range of pressures with the temperatures near 310 K. The spectral resolution varies from approximately 0.4 to 0.6/cm. Also included are data on the continuum absorption by H2O between 300 and 825/cm. Experimental data on H2O absorption are compared with data calculated on the basis of several theoretical line shapes. The H2O continuum absorption decreases more rapidly with increasing temperature than is predicted by line-shape theories.
Author (GRA)

N79-14669# Air Force Geophysics Lab., Hanscom AFB, Mass.
ABOUT THE DEVELOPMENT OF A SECOND GENERATION ATMOSPHERIC SAMPLER CONTROL AND DATA SYSTEM: SCADS-2 Final Report
Robert H. Cordella, Jr. 16 Mar. 1978 240 p refs
(AD-A060062; AFGL-TR-78-0065; AFGL-IP-264) Avail: NTIS HC A11/MF A01 CSCL 04/1

This report documents the development of an atmospheric sampling control and data acquisition system (SCADS) for the Department of Energy's high-altitude, balloon-borne monitoring program. The period documented spans 5 calendar years ending with 1977. Sources for technical information are referenced.
Author (GRA)

N79-14670# Naval Surface Weapons Center, Dahlgren, Va.
LOW-ALTITUDE EXPANSIONS OF GEODETIC KERNELS Final Report
John V. Shebalin Jul. 1978 23 p ref
(AD-A059406; NSWC/DL-TR-3855) Avail: NTIS HC A02/MF A01 CSCL 08/5

The three important kernels of Physical Geodesy (Stokes', Poisson's, and the Coating kernel) are first considered in their traditional forms (closed-form analytic and Legendre polynomial expansion) and then given in new forms (expansions in powers of the altitude divided by the earth's radius). Useful results concerning these expansions are then given and their domain of applicability is determined. Finally, the accuracy and implementation of these low-altitude expansions is discussed. Author (GRA)

N79-14671# Lowell Univ. Research Foundation, Mass.
DIGITAL IONOSPHERIC SOUNDING IN THE ARCTIC Final Report, 13 Oct. 1976 - 30 Mar. 1977
Klaus Bibl, Bodo W. Reinisch, and Sheryl Smith May 1978 72 p refs
(Contract F19628-77-C-0024)
(AD-A059479; ULRF-391/CAR; AFGL-TR-78-0109) Avail: NTIS HC A04/MF A01 CSCL 04/1

A Digisonde 128PS measures incidence angles and Doppler shifts within the ionograms. An airborne Digisonde onboard AFGL's Flying Ionospheric Observatory uses the Doppler information to estimate the angle of arrival of the echoes. The monthly median curves of the Goose Bay ionospheric parameters are presented for the period March 1976 to April 1977 GRA

N79-14672# Texas Univ. at Austin.
RESEARCH NEEDS AND PRIORITIES FOR GEOTECHNICAL EARTHQUAKE ENGINEERING APPLICATIONS
K. L. Lee, ed, W. F. Marcuson, ed, K. H. Stoke, ed, and F. Y. Yokel, ed 1978 150 p Conf. held at Texas Univ., Austin, 2-3 Jun. 1977 Sponsored by NSF, Wash., D. C.
(PB-286142/5; NSF/RA-780223) Avail: NTIS HC A07/MF A01 CSCL 08K

A workshop was held to discuss research needs and priorities in geotechnical earthquake engineering. Group discussions involved some of the following topics: (1) dynamic soil properties and measurement techniques in the laboratory; (2) dynamic soil properties and measurement techniques in the field; (3) analytical procedures and mathematical modeling; (4) design earthquakes, ground motion, and surface faulting; and (5) assessment of seismic stability of soil. The workshop recommended that applied research be carried out to: improve understanding of basic fundamentals; improve design methods; evaluate and verify the design procedures; and transfer technology. GRA

N79-14673# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
A CATALOG OF LOW-FREQUENCY OSCILLATIONS OF THE EARTH'S MAGNETIC FIELD AS OBSERVED AT SMS-1 Data Report, Nov. 1974 - Mar. 1975
R. E. Newell and J. N. Barfield May 1978 21 p refs
(PB-286773/7; NOAA-DR-ERL-SEL-1; NOAA-78083001) Avail:

NTIS HC A02/MF A01 CSCL 04A

SMS-1 was located at 75 degrees west geographic longitude. Pulsation events are catalogued which display at least five continuous cycles and frequency which is roughly constant. When different frequencies dare present at the same time, each is identified as an event. Only pulsations with a peak amplitude of at least 3 gammas are included in the catalog. GRA

N79-14674# National Oceanic and Atmospheric Administration, Boulder, Colo. Air Resources Labs.

MONITORING THE SOLAR CONSTANT AND SOLAR ULTRAVIOLET. REPORT AND RECOMMENDATIONS

Mar. 1978 70 p refs Workshop held at Estes Park, Colo., 8-12 Aug. 1977

(PB-286774/5; NOAA-78083002) Avail: NTIS HC A04/MF A01 CSCL 04A

A workshop was initiated by the Geophysical Monitoring for Climatic Change program. The workshop consisted of two parts. The first was a series of special presentations by experts in the various disciplines. The second was a series of four simultaneous panel discussions: Atmospheric and Climatic Effects; Solar Variability; Monitoring the Sun from Space; and Monitoring the Sun from Within the Earth's Atmosphere. Each panel deliberated on its own research program. The findings reached in panel discussions and the recommendations as set forth by the participants are presented. GRA

N79-14983# Joint Publications Research Service, Arlington, Va.

PREDICTING THE TIME OF OCCURRENCE OF EARTHQUAKES

Mikhail Aleksandrovich Sadovskiy *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 32-38 Transl. into ENGLISH from Zemlya Vselennaya (Moscow), no. 6, 1978 p 6-9 (For primary document see N79-14983 05-99)

Copyright. Avail: NTIS HC A05/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N79-14675*# Dayton Univ. Research Inst., Ohio.

PREDICTION AND MONITORING OF CLEAR AIR TURBULENCE: AN EVALUATION OF THE APPLICABILITY OF THE RAWINSONDE SYSTEM

John L. Keller Dec. 1978 58 p refs

(Contract NAS8-32111)

(NASA-CR-3072; M-270) Avail: NTIS HC A04/MF A01 CSCL 04B

The applicability of rawinsonde data for either detection or prediction of clear air turbulence is discussed. The mechanism currently believed responsible for the development of CAT is reviewed. Since previous studies determined that the most significant factor for the existence of turbulent layers is the magnitude of the vertical shear, certain theoretically derived shear criteria was applied to statistical and diagnostic comparisons of rawinsonde and Jimsphere/Jimsonde conjunctive vertical profiles. It is determined that the Rawinsonde system cannot reliably be used as a CAT detector in a single-station sense. G.G.

N79-14676*# Texas A&M Univ., College Station. Dept. of Meteorology.

STUDIES OF VORTICITY IMBALANCE AND STABILITY, MOISTURE BUDGET, ATMOSPHERIC ENERGETICS, AND GRADIENTS OF METEOROLOGICAL PARAMETERS DURING AVE 3 Final Report

James R. Scoggins, ed. Dec. 1978 142 p refs

(Contract NAS8-31773)

(NASA-CR-3084; M-277) Avail: NTIS HC A07/MF A01 CSCL 04B

Four diagnostic studies of AVE 3. are presented. AVE 3 represents a high wind speed wintertime situation, while most AVE's analyzed previously represented springtime conditions with rather low wind speeds. The general areas of analysis include the examination of budgets of vorticity, moisture, kinetic energy, and potential energy and a synoptic and statistical study of the horizontal gradients of meteorological parameters. Conclusions are integrated with and compared to those obtained in previously analyzed experiments (mostly springtime weather situations) so as to establish a more definitive understanding of the structure and dynamics of the atmosphere under a wide range of synoptic conditions. L.S.

N79-14677*# Alabama Univ. in Huntsville.

HYGROSCOPIC CHEMICALS AND THE FORMATION OF ADVECTION WARM FOG: A NUMERICAL SIMULATION

R. J. Hung and G. S. Liaw Dec. 1978 66 p refs

(Contract NAS8-31729)

(NASA-CR-3085; M-278) Avail: NTIS HC A04/MF A01 CSCL 04B

The formation of advection fog is closely associated with the characteristics of the aerosol particles, including the chemical composition, mass of the nuclei, particle size, and concentration. Both macrophysical and microphysical processes are considered. In the macrophysical model, the evolution of wind components, water vapor content, liquid water content and potential temperature under the influences of vertical turbulent diffusion, turbulent momentum, and turbulent energy transfers are taken into account. In the microphysical model, the supersaturation effect is incorporated with the surface tension and hygroscopic material solution. Author

N79-14678*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SUMMARY OF ATMOSPHERIC WIND DESIGN CRITERIA FOR WIND ENERGY CONVERSION SYSTEM DEVELOPMENT

Walter Frost (Tennessee Univ. Space Inst., Tullahoma) and Robert E. Turner Jan. 1979 54 p

(Contract NAS8-32118)

(NASA-TP-1389; M-280) Avail: NTIS HC A04/MF A01 CSCL 04B

Basic design values are presented of significant wind criteria, in graphical format, for use in the design and development of wind turbine generators for energy research. It is a condensed version of portions of the Engineering Handbook on the Atmospheric Environmental Guidelines for Use in Wind Turbine Generator Development. Author

N79-14679*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ENGINEERING HANDBOOK ON THE ATMOSPHERIC ENVIRONMENTAL GUIDELINES FOR USE IN WIND TURBINE GENERATOR DEVELOPMENT

Walter Frost (Tennessee Univ. Space Inst., Tullahoma), B. H. Long (Tennessee Univ. Space Inst., Tullahoma), and R. E. Turner Dec. 1978 379 p refs

(NASA-TP-1359; M-267) Avail: NTIS HC A17/MF A01 CSCL 04B

The guidelines are given in the form of design criteria relative to wind speed, wind shear, turbulence, wind direction, ice and snow loading, and other climatological parameters which include rain, hail, thermal effects, abrasive and corrosive effects, and humidity. This report is a presentation of design criteria in an engineering format which can be directly input to wind turbine generator design computations. Guidelines are also provided for developing specialized wind turbine generators or for designing wind turbine generators which are to be used in a special region of the United States. Author

N79-14680*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SEQUENTIAL HIGH-RESOLUTION WIND PROFILE MEASUREMENTS

D. L. Johnson and W. W. Vaughan Dec. 1978 411 p refs

(NASA-TP-1354) Avail: NTIS HC A18/MF A01 CSCL 04B

Tropospheric flow and lower stratospheric flow as measured by 94 sequences of high-resolution Jimsphere balloon data are presented and discussed. The 70 and 24 sequential series are presented for the Kennedy Space Center, Florida, and Point Mugu, California, areas, respectively. Supplemental data, consisting

of the associative temperature profiles and surface and 200 mb synoptic maps, are also presented. The measurements are discussed relative to both the engineering and disciplinary areas. An initial subjective analysis of mesoscale features observed on some sequences is presented. Author

N79-14681# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DEFORESTATION OF THE AMAZONAS JUNGLE AND ITS EFFECTS ON CLIMATE
Luiz Carlos Baldicero Molion Nov. 1978 10 p refs Revised Submitted for publication
(INPE-1391-PE/183) Avail: NTIS HC A02/MF A01

Deforestation of the Amazonas Forest in South America is continuing at higher rates. The influence of the Amazonas Forest on the hydrologic cycle and on the climate is presented. Fifty percent of the high rainfall rates observed in the region is constituted by locally evaporated water. Deforestation reduces evaporation and therefore the local rainfall. The hypothesis that such a large forest may have influence on the global climate is discussed. S.E.S.

N79-14682*# Utah Univ., Salt Lake City. Dept. of Meteorology.
ANALYSES OF MEAN AND TURBULENT MOTION IN THE TROPICS WITH THE USE OF UNEQUALLY SPACED DATA
S. K. Kao and E. J. Nimmo Jan. 1979 41 p refs
(Contract NAS6-2498)
(NASA-CR-3078) Avail: NTIS HC A03/MF A01 CSCL 04B

Wind velocities from 25 km to 60 km over Ascension Island, Fort Sherman and Kwajalein for the period January 1970 to December 1971 are analyzed in order to achieve a better understanding of the mean flow, the eddy kinetic energy and the Eulerian time spectra of the eddy kinetic energy. Since the data are unequally spaced in time, techniques of one-dimensional covariance theory were utilized and an unequally spaced time series analysis was accomplished. The theoretical equations for two-dimensional analysis or wavenumber frequency analysis of unequally spaced data were developed. Analysis of the turbulent winds and the average seasonal variance and eddy kinetic energy of the turbulent winds indicated that maximum total variance and energy is associated with the east-west velocity component. This is particularly true for long period seasonal waves which dominate the total energy spectrum. Additionally, there is an energy shift for the east-west component into the longer period waves with altitude increasing from 30 km to 50 km. G.G.

N79-14683# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SOME ASPECTS OF CLOUDS OVER SOUTH AMERICA, BASED ON METEOROLOGICAL SATELLITES [ALGUNS ASPECTOS DA NEBULOSIDADE SOBRE A AMERICA DO SUL, OBTIDA POR SATELLITES METEOROLOGICOS]
Heloisa M. T. Nunes and Zinaide Rosa Sobral Oct. 1978 69 p refs In PORTUGUESE
(INPE-1365-PE/170) Avail: NTIS HC A04/MF A01

Very high resolution infrared imagery transmitted by NOAA 4 and NOAA 5 satellites is used to identify some of the principal characteristics of the cloudiness found over South America and to associate these characteristics with the predominant atmospheric conditions in areas lacking conventional methods of observation. The capabilities of the NOAA 5 sensors are summarized. Various cloud formations over the Atlantic Ocean, coastal areas, and various sections of the continent are examined from 51 photographs which are included in the appendix. Transl. by A.R.H.

N79-14684# Old Dominion Univ., Norfolk, Va. Dept. of Geophysical Sciences.
EVALUATION OF EXTENDED PERIOD FORECASTING TECHNIQUE Annual Report, 1 Jun. 1977 - 31 Aug. 1978
Earl C. Kindle Sep. 1978 70 p refs
(Contract N00014-77-C-0377)
(AD-A059451; GSTR-78-12) Avail: NTIS HC A04/MF A01 CSCL 04/2

This project was undertaken to establish a statistical correlation between solar activity and atmospheric circulation patterns. Solar activity data used were sunspot numbers and changes occurring in sunspot numbers over three and five day periods, and meteorological data included the frequency of ridges, troughs, and low-pressure systems in key locations off the east and west coasts of North America. Numerous combinations of input data demonstrated only subtle correlations; however, when one considers the smallness of the solar energy variations in relation to the magnitude of circulation responses, even a subtle relationship indicated too strong a probability of solar influence on weather circulation patterns to be ignored. Hence, part of the research effort during the past year was directed toward discovering a physical mechanism to explain the types of circulation behavior observed. One such mechanism is possibly the stratospheric warming induced by increased intensity of ultraviolet radiation during solar active periods. A qualitative concept of how this warming and stratification of the atmosphere could assist the atmosphere in more effectively converting potential energy to kinetic energy was developed, and plans for a simple numerical model to quantify this concept are underway. Author (GRA)

N79-14685# Rome Air Development Center, Griffiss AFB, N.Y.
LONG-TERM STATISTICS OF ATMOSPHERIC TURBULENCE NEAR THE GROUND Technical Report, 1 Jan. 1975 - 1 Jan. 1978
James L. Spencer Aug. 1978 134 p refs
(ARPA Order 2646)
(AD-A059439; RADC-TR-78-182) Avail: NTIS HC A07/MF A01 CSCL 04/1

A long-term experiment has measured ground-level atmospheric turbulence during all types of weather. From four months of accumulated data, long-term averages have been calculated. Probability distributions and other pertinent statistics have also been evaluated. GRA

N79-14686# Transportation Systems Center, Cambridge, Mass.
WIND SHEAR REQUIREMENTS AND THEIR APPLICATION TO LASER SYSTEMS Final Report, Mar. 1976 - Dec. 1976
Rudolph M. Kalafus Feb. 1978 139 p refs
(AD-A054174; DOT-TSC-FAA-77-5) Avail: NTIS HC A07/MF A01 CSCL 04/2

The requirements for a ground-based wind shear sensing system are developed. System coverage, accuracy, resolution, and data update rate are treated in detail. The differing requirements for synoptic shear conditions and thunderstorm-associated shears are discussed. Several candidate sensing systems are considered. The hybrid CW/ pulsed laser is discussed in detail because of its potential for providing advance warning for all shear conditions. Propagational characteristics of laser beams are treated and equipment design implications are developed. A system concept is outlined which provides the framework for a future operational system. Author (GRA)

N79-14687# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
VERIFICATION OF WIND MEASUREMENT WITH MOBILE LASER DOPPLER SYSTEM Final Report, Jul. 1975 - Nov. 1976
M. R. Brashears and W. R. Eberle Sep. 1977 162 p refs
(Contract DOT-TSC-1098)
(AD-A047252; LMSC-HREC-TR-D497071; FAA-RD-77-117; TSC-FAA-77-14) Avail: NTIS HC A08/MF A01 CSCL 04/2

The Mobile Atmospheric Unit is a laser Doppler velocimeter system designed for the remote measurement of the three components of atmospheric wind. The unit was tested to verify the capability of the system to measure wind remotely and to evaluate alternative data-processing algorithms. Remotely measured wind data are compared with concurrent data measured by anemometers on a 150-meter meteorological tower. The test program showed that the laser Doppler velocimeter system is an accurate instrument for the remote measurement of winds. GRA

N79-14688# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
A TECHNIQUE FOR ESTIMATING CLOCK TWO-HOURLY PRECIPITATION RATE DISTRIBUTIONS Final Report
Daniel J. McMorrow May 1978 18 p refs

(AD-A059874; USAFETAC-TN-78-002) Avail: NTIS HC A02/MF A01 CSCL 04/2

Clock two-hourly precipitation rate distributions can be derived from distributions of clock-hourly precipitation rate distribution by using negative exponential functions. The analytical conversions are provided for 16 climatic regimes in the continental United States and Alaska. The clock-hourly and two-hourly precipitation rate distributions are also compared with instantaneous distributions measured over horizontal paths. Author (GRA)

N79-14689# Colorado State Univ., Fort Collins.

NEW RESULTS OF TOPICAL CYCLONE RESEARCH FROM OBSERVATIONAL ANALYSIS

William M. Gray and William M. Frank Monterey, Calif. Naval Environmental Prediction Research Facility Jun. 1978 109 p refs Sponsored in part by NSF and NOAA

(Contract N00228-76-C-2129; ZF52551001)

(AD-A060077; NEPRF-TR-78-01) Avail: NTIS HC A06/MF A01 CSCL 04/2

Up-to-date results of recent tropical cyclone research at Colorado State University are presented. Particular attention is paid to new findings which impact on tropical cyclone forecasting and modeling efforts. Observational studies using large amounts of composited rawinsonde, satellite and aircraft flight data have been performed to analyze tropical cyclone genesis, structure, energetics, intensity, intensity change, and motion. Author (GRA)

N79-14690# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

THE 12832A LANCE, MISSILE NUMBER 3370, ROUND NUMBER 317 RCL (20 JULY 1978)

Aug. 1978 38 p

(DA Proj. 1T6-65702-D-127)

(AD-A059915; ECOM-DR-976) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12832A lance, missile number 3370, round number 317 rcl, are presented in tabular form. Author (GRA)

N79-14691# Army Electronics Command, White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.

THE 12827A LANCE, MISSILE NUMBER 4444, ROUND NUMBER 318 NPL (25 AUGUST 1978)

Sep. 1978 39 p

(DA Proj. 1T6-65702-D-127)

(AD-A059916; ECOM-DR-977) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12827A Lance, Missile Number 4444, Round Number 318 NPL, are presented in tabular form. Author (GRA)

N79-14692# Naval Postgraduate School, Monterey, Calif.

TESTS OF A MESOSCALE MODEL OVER EUROPE AND THE UNITED STATES Technical Report, 1 Oct. 1977 - 22 Sep. 1978

Richard A. Anthes Aug. 1978 108 p refs

(AD-A059905; NPS-63-78004) Avail: NTIS HC A06/MF A01 CSCL 04/2

A total of 32 twenty-four-hour forecasts using a six-layer, 60-km mesh model have been run over western Europe and the eastern United States. The forecasts showed considerable skill in forecasting cyclogenesis over the Mediterranean and the U.S. The average 24-hour S1 score for sea-level pressure was 39.1 compared to an average of 45.9 for the FNWC operational model and 73.4 for persistence. The major conclusion from this study is that significant improvements in 24-hour sea-level pressure forecasts were obtained by a model with high horizontal resolution, even though the vertical resolution was coarse and the physics in the model was simple. It appears likely, therefore, that further increases in forecast accuracy are possible by refining the vertical resolution and improving the physics. GRA

N79-14693# Naval Postgraduate School, Monterey, Calif.

AN INITIALIZATION PROCEDURE FOR LIMITED-AREA MODELS FOR NUMERICAL WEATHER PREDICTION Final Report, Oct. 1977 - Sep. 1978

Daniel Keyser Aug. 1978 73 p refs

(AD-A059974; NPS-63-78003) Avail: NTIS HC A04/MF A01 CSCL 04/2

This paper describes a diagnostic objective analysis procedure designed to derive dynamically consistent three-dimensional fields of horizontal wind velocity, geopotential and temperature over limited-area subsynoptic and mesoscale domains. These analyses provide data for initial and boundary conditions for the fine-mesh model tests over the United States and Europe made at Fleet Numerical Weather Central (FNWC) and described by Anthes (1978). Objective analyses are produced on nine standard pressure levels over 70 x 70 unstaggered 60-km Cartesian grids on Lambert conformal map projections covering the United States and western Europe including the western Mediterranean Sea. GRA

N79-14694# Bureau of Reclamation, Denver, Colo. Office of Atmospheric Resources Management.

SIERRA COOPERATIVE PILOT PROJECT, 1977-78 DATA INVENTORY

Jun. 1978 133 p

(PB-285405/7) Avail: NTIS HC A07/MF A01 CSCL 04B

An inventory of all data that were collected in association with the Sierra Cooperative Pilot Project (SCPP), a weather modification research project in winter orographic cloud seeding, from November 1977 to April 1978 is presented. It is subdivided into 13 sections:(1)site maps, (2)radar, (3)satellite, (4)aircraft (5) rawinsondes and pibals, (6) acoustic sounder, (7) precipitation gages, (8) snow profile, (9) joss disdrometer, (10) ice crystal and ice nucleus, (11) transport and diffusion, (12) project surface observations, and (13) NWS, FAA, and National Climatic Center products. GRA

N79-14695# National Weather Service, Silver Spring, Md.

OPERATIONS OF THE NATIONAL WEATHER SERVICE

Jan. 1978 316 p

(PB-286739/8; NOAA-78022202) Avail: NTIS HC A14/MF A01 CSCL 04B

The National Weather Service (NWS), under the National Oceanic and Atmospheric Administration (NOAA), has a vast operating program. The provision of forecasts and weather warnings to the general public and specialized users is the head of the NWS operations. Warnings from both WSFOs and WSOs are issued for severe weather such as hurricanes, tornadoes, severe thunderstorms, flash flooding, and extreme winter weather. The National Severe Storms Forecast Center in Kansas City, Mo, and the National Hurricane Center in Miami provide the main support for the warning program. The River Forecast Centers issue river stage forecasts for use by the public as well as special flow forecasts for use by irrigation, navigation, and hydroelectric power generation interests. GRA

N79-14696# National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.

THE FACE CONFIRMATORY PROGRAM (FACE-2): DESIGN AND EVALUATION SPECIFICATIONS, JUNE 1, 1978

William L. Woodley, Robert I. Sax, Joanne Simpson, Ronald Biondini, and John A. Flueck Jun. 1978 58 p refs

(PB-286741/4; NOAA-TM-ERL-NHEML-2; NOAA-78082801) Avail: NTIS HC A04/MF A01 CSCL 04B

The design and prospective evaluation for the confirmatory phase of the Florida Cumulus Experiment, called FACE-2, are specified. FACE is a continuing effort to determine the potential of dynamic seeding for increasing convective rainfall over a fixed target area. FACE-2 will be an intensive program to obtain a minimum of 35 randomized days of experimentation. Every effort will be made to obtain the required sample during the summer of 1978. The design for FACE-2 is similar to that of FACE 1976. The double-blind nature of the experiment was strengthened, and fixed periods of experimentation, treatment, and observation are specified. GRA

N79-14697# Arizona Univ., Tucson. Inst. of Atmospheric Physics.

A LABORATORY EXAMINATION OF THE ICE-NUCLEATING ABILITY OF AgI-AEROSOL USING A LOW PRESSURE FILTER PROCESSOR Final Report

Kenneth C. Young 25 Apr. 1978 22 p refs

(Grant NOAA-04-06-022-44038)

(PB-286891/7; NOAA-78082904) Avail: NTIS HC A02/MF A01 CSCL 04B

An AgI aerosol generating system was constructed which used a modified airborne AgI-acetone generator that was mounted in a fan driven wind tunnel. An associated dynamic dilution system and an aerosol sampling system were also constructed to provide a source of the AgI-acetone aerosol. The aerosol was collected on Millipore filters, which were examined with a low pressure filter processor for the ice nucleation activity of the AgI. The deposition and condensation-freezing modes of activity were studied for a wide range of temperatures and ice supersaturation values. The relative importance of the deposition and the condensation-freezing modes can be inferred by examination of the nucleation activity contours for a wide range of temperatures and supersaturations. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N79-14698*# Rhode Island Univ., Kingston. Dept. of Ocean Engineering.

A NESTED NUMERICAL TIDAL MODEL OF THE SOUTHERN NEW ENGLAND BIGHT Final Report

Robert B. Gordon and Malcolm L. Spaulding Jan. 1979 62 p refs

(Grant NsG-1008)

(NASA-CR-158020) Avail: NTIS HC A04/MF A01 CSCL 08C

Efforts were focused on the development and application of a three-dimensional numerical model for predicting pollutant and sediment transport in estuarine and coastal environments. To successfully apply the pollutant and sediment transport model to Rhode Island coastal waters, it was determined that the flow field in this region had to be better described through the use of existing numerical circulation models. A nested, barotropic numerical tidal model was applied to the southern New England Bight (Long Island, Block Island, Rhode Island Sounds, Buzzards Bay, and the shelf south of Block Island). Forward time and centered spatial differences were employed with the bottom friction term evaluated at both time levels. Using existing tide records on the New England shelf, adequate information was available to specify the tide height boundary condition further out on the shelf. Preliminary results are within the accuracy of the National Ocean Survey tide table data. J.M.S.

N79-14699# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

APPLICATION OF REMOTE SENSING TO THE ESTIMATION OF CHLOROPHYLL IN OCEAN WATER [O SENSORIAMENTO REMOTO APLICADO NA ESTIMATIVA DA CONCENTRACAO DE CLOROFILA NO MAR]

Joao Antonio Lorenzzetti Oct. 1978 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 5th Simp. Latinoam. Sobre Oceanog. Biol., Sao Paulo, Brazil, 20-25 Nov. 1978

(INPE-1380-PE/177) Avail: NTIS HC A02/MF A01

The feasibility of estimating the chlorophyll content of ocean waters through the use of multispectral remote sensors on board orbiting satellites is discussed. Some aspects of the physical foundations of the interaction processes of visible light with the atmosphere and liquid mass and some models for this detection are included. J.M.S.

N79-14700# Naval Postgraduate School, Monterey, Calif.

PROBABILITY DENSITY FUNCTIONS OF BREAKING WAVES M.S. Thesis

George Schaeffer, III Jun. 1978 68 p refs

(AD-A059693) Avail: NTIS HC A04/MF A01 CSCL 08/3

Waves in the surf zone are a highly nonlinear process which is evident by the appearance of secondary waves. The secondary waves appear as strong peaks in the period PDFs corresponding to the first harmonic of the peak of the wave spectrum. The strong first harmonic period peak is also reflected in the highly correlated height and velocity PDFs. Breaking waves may be viewed as a gradation between two extremes. The period, height and velocity PDFs for spilling breakers generally were unimodal, whereas for plunging breakers strong bimodality was found. The joint probability density functions for periods and heights of the breaking waves show high correlation (0.60-0.80) which says that greater wave periods are associated with larger breaker heights. The joint PDFs of period and particle velocity, and velocity height, suggest that the maximum onshore particle velocities are correlated with both the wave periods and wave heights. Due to the high probability of the secondary waves, the mean wave period for breakers is a poor descriptor of the average period of the offshore incident waves. Author (GRA)

N79-14701# Virginia Polytechnic Inst. and State Univ., Blacksburg. Virginia Water Resources Research Center.

MODELING SEDIMENT MOVEMENT IN THE TURBIDITY MAXIMUM OF AN ESTUARY

Albert Kuo, Maynard Nichols, and James Lewis Jun. 1978 80 p refs Prepared by Virginia Inst. of Marine Science

(OWRT Proj. B-077-VA(1))

(PB-285989/0; VPI-VWRRC-BULL-111; W78-11213) Avail: NTIS HC A05/MF A01 CSCL 13B

A two dimensional, time dependent numerical model to simulate the movement of water and suspended sediment in the turbidity maximum of an estuary was developed. The model is a systematic sequence of mathematical procedures derived from the mass-balance equation and the equation of motion. Lateral integration was used to obtain two dimensional equations. These equations were integrated with depth over the height of successive layers. Finite difference equations then were written for each layer and solved numerically using prescribed boundary conditions. The model yields values for time varying tidal height, current speed, salinity, and suspended sediment concentration (turbidity) throughout the estuary. GRA

N79-14702# Texas A&M Univ., College Station. Dept. of Oceanography.

OCEANOGRAPHIC DATA COLLECTED ABOARD R/V T. G. THOMPSON DURING FDRAKE 76, LEGS 1 AND 2

T. Whitworth, W. D. Nowlin, Jr., L. I. Gordon, and G. C. Anderson May 1977 248 p refs

(Grant NSF OCE-76-80410)

(PB-286100/3; TAMU-REF-78-1D; NSF/IDOE-78/101) Avail: NTIS HC A11/MF A01 CSCL 08C

The second phase of the First Dynamic Response and Kinematics Experiment (FDRAKE) was conducted in Drake Passage during February and March 1976. During the first leg, the year-long array of current, temperature, and pressure recorders deployed during FDRAKE 75 was recovered and a replacement array was installed. Twenty-five hydrographic/STD stations were occupied across the Passage and in the vicinity of the new array. The second leg was devoted to a closely-spaced hydrographic/STD section across the Passage 25 km east of the moored array. Plots of hydrographic bottle and STD data are given. GRA

N79-14703# National Ocean Survey, Rockville, Md.

TIDE TABLES, 1979. HIGH AND LOW WATER PREDICTIONS. EUROPE AND WEST COAST OF AFRICA INCLUDING THE MEDITERRANEAN SEA

1978 213 p

(PB-286735/6; NOAA-78082201) Avail: NTIS HC A10/MF A01 CSCL 08C

This edition of the Tide Tables, Europe and West Coast of Africa contains full daily predictions for 37 reference stations and differences and ranges for about 1,000 stations. It also contains a table for obtaining the approximate height of the tide at any time, a table of local mean time of sunrise and sunset for every fifth day of the year for different latitudes, a table for reduction of local mean time to standard time, a table for converting feet to meters, a table of the Greenwich mean time of the moon's phases, apogee, perigee, greatest north and south and zero declination, and the time of the solar equinoxes and solstices, and a glossary of terms. GRA

N79-14704# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.

A SHALLOW WATER PRESSURE-TEMPERATURE GAGE (PTG): DESIGN, CALIBRATION, AND OPERATION

Stanley P. Hayes, John Glenn, and Nancy N. Soriede Jun. 1978 36 p refs

(PB-286754/7; NOAA-TM-ERL-PMEL-12; NOAA-78081801)

Avail: NTIS HC A03/MF A01 CSCL 08J

An internally recording, low power instrument to measure water pressure and temperature in water depths of up to 250 m is described. Calibration and processing techniques are discussed and some field results are presented. The gage uses a quartz crystal pressure transducer, an epoxy-coated thermistor, and a commercially available digital recording system. Calibration results show a temperature dependence which can amount to 1 mb/degree C for some gages at some pressures. This is a combined effect due to the temperature dependence of the clock and of the pressure transducer. Long-term drift of the pressure transducer could not be accurately assessed by the laboratory tests, but appeared to be roughly of the same magnitude as the manufacturer's specification for the transducer. Results from deployments in the Gulf of Alaska showed six month records which had trends of less than 1 cm/mo. Much of this trend could be oceanic. GRA

N79-14706# Georgia Marine Science Center, Savannah.
HYDROGRAPHIC OBSERVATIONS IN THE GEORGIA BIGHT (APRIL 1977)
P. G. Malley, L. P. Atkinson, J. J. Singer, W. S. Chandler, and T. N. Lee Jul. 1978 219 p refs Prepared in cooperation with Skidaway Inst. of Oceanography
(Contract EY-76-S-09-0889; Grant NOAA-04-7-158-44126)
(PB-286711/7; GMSC-TR-78-5; NOAA-78082807) Avail: NTIS HC A10/MF A01 CSCL 08J

During two cruises in the Georgia Bight in April 1977, nine hydrographic and three XBT transects were conducted. Temperature, salinity, dissolved oxygen, and nutrient (NO3, PO4, and SiO2) data were collected. Generally, the continental shelf water was well mixed vertically and characterized by low nutrient concentrations and oxygen saturation. However, bottom and interlayering intrusions of Gulf Stream water onto the shelf were observed. Satellite thermal images revealed a Gulf Stream spin-off eddy which was subsequently mapped and intensively sampled. Strong upwelling of dense, cold, nutrient-rich, and oxygen depleted water was associated with the eddy event, it is likely that the regular occurence of spin-off eddies provides a mechanism for significant nutrient enrichment of the continental shelf. GRA

N79-14708# State Univ. of New York at Stony Brook. Marine Sciences Research Center.
TRANSPORT PROCESSES IN ESTUARIES: RECOMMENDATIONS FOR RESEARCH Final Report, 1 May 31 Aug. 1977
B. Kinsman, J. R. Schubel, M. J. Bowman, A. Oubo, H. H. Carter, D. W. Pritchard, and R. E. Wilson 25 Apr. 1978 27 p refs Workshop held at Stony Brook, N. Y., 10-14 Nov. 1976 Sponsored in part by NOAA, DOE and ONR
(Contract EPA-WD-699-1058J)
(PB-285927/0; Special-Rept-6) Avail: NTIS HC A03/MF A01 CSCL 08C

A review of the state of current knowledge of physical transport processes of water, salt, and fine grained suspended sediments in estuaries is presented. Other items discussed are the manpower and material necessary for the field experiments on which the solution of important unresolved problems must depend. GRA

N79-14707# Woods Hole Oceanographic Institution, Mass.
POLYMODE XBT SURVEYS BY THE SOVIET RESEARCH VESSELS AKADEMIK KRILOV AND AKADEMIK VERDNADSKY Technical Report, 22 Sep. - 16 Oct. 1977
Aug. 1978 27 p refs
(Grant NSF OCE-77-01026)
(PB-286368/6; XBT/TR-78/7; NSF/IDOE-78/95) Avail: NTIS HC A03/MF A01 CSCL 08J

Track charts and various presentations of the thermal structure in vertical and/or plan view, depending on the pattern of the data, are included along with brief description of the major eddy features. The purpose of these reports is to distribute the XBT information as expeditiously as possible to a wide audience of POLYMODE investigators and others who might be interested. The POLYMODE XBT surveys covered by this report were carried out by Soviet scientists aboard two Soviet research ships, AKADEMIK KRILOV and AKADEMIK VERNADSKY. Portions of the XBT work form this same cruise of KRILOV have been dealt with in two earlier reports. This report is concerned with observations made between 22 September and 7 October covering the area between 26 deg 30 min and 31 deg 30 min N, 67 deg and 73 deg W. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N79-14708# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 47
27 Oct. 1978 52 p refs Transl. into ENGLISH from various Russian journals
(JPRS-72134) Copyright. Avail: NTIS HC A04/MF A01

Information is presented on the U.S.S.R.'s research efforts in the following areas: (1) ergonomics, (2) industrial microbiology, (3) instruments and equipment, (4) psychology and (5) scientists and scientific organizations. For individual titles, see N79-14709 through N79-14710.

N79-14709# Joint Publications Research Service, Arlington, Va.
PSYCHOLOGICAL EXPERIMENT ON COMPONENTS OF THE MEANING OF WORK c54
V. I. Batov and M. V. Yermolayeva *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 47 (JPRS-72134) 27 Oct. 1978 p 1-8 refs Transl. into ENGLISH from Tekh. Estetika (Moscow), No. 8, 1978 p 13-15 (For primary document see N79-14708 05-51)
Copyright. Avail: NTIS HC A04/MF A01

The goal of the investigation, finding psychological criteria for standardization of activities, has many levels. On the level of operations, formalization is possible. In other words, a norm can be worked out for the method of performance of a concrete action so that the performance can be monitored and evaluated; but the internal aspect of the action, related to the goal function, was assumed to be unformalizable, and that is precisely why difficulties arise in standardizing operator activity. These difficulties result primarily from the fact that the problem of measuring the individual indexes of inner activity in human factors engineering and ergonomics has hardly even been raised. The article is devoted to a discussion of the possibility of objectively defining certain mechanisms of inner activity. Author

N79-14710# Joint Publications Research Service, Arlington, Va.
EFFECTS OF LASER RADIATION ON MORPHOLOGY OF PERIPHERAL BLOOD AND BONE MARROW UNDER EXPERIMENTAL AND CLINICAL CONDITIONS c52
G. V. Golovin, I. G. Dutkevich, and A. P. Sarkisyan *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 47 (JPRS-72134) 27 Oct. 1978 p 28-37 refs Transl. into ENGLISH from Vestn. Khir. (Leningrad), no. 8, 1978 p 121-126 (For primary document see N79-14708 05-51)
Copyright. Avail: NTIS HC A04/MF A01

Experimental studies have shown that, under specific irradiation modes, low-energy laser radiation stimulates physiological functions of the organism, improves metabolic processes, has an anti-inflammation and vasodilating effect, stimulates erythropoiesis, glycogen synthesis, tissular regeneration, etc. Conversely, studies have also shown that under certain other conditions, laser irradiation does cause some damage to the hemopoietic system. These results of experimental research illustrate adequately the extent to which the obtained data are contradictory and difficult to compare, due to the differences in radiation methods used, insufficient number of animals in experimental groups, etc. At the same time, it is obvious that the hemopoietic system does react, and it is just as obvious that more comprehensive studies of such reactions are required. L.S.

N79-14711*# National Aeronautics and Space Administration, Washington, D. C.
MATERIALS OF THE FINAL REPORTS ON THE JOINT

SOVIET-AMERICAN EXPERIMENT ON THE KOSMOS-936 BIOSATELLITE

N. V. Timofeyev-Resolskiy, G. P. Parfenov, M.G. Tairbekov, R. N. Platonova, A. V. Rostopshina, V. P. Zhvalikovskaya, I. Ye. Mosgovaya, V. N. Shvets, Ye. Ye. Kovalev, V. Ye. Dudkin et al Dec. 1978 45 p refs Transl. into ENGLISH of "Materialy Itogovykh Otchetov po Sovmestnym Sovetsko-Amerikanskim Eksperimentam na Biosputnike Kosmos-936", Inst. of Med. and Biol. Probl., Moscow, 1978 p 1-58 Transl. by Kanner (Leo), Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-75582) Avail: NTIS HC A03/MF A01 CSCL 06C

Biological experiments onboard the Kosmos-936 investigated the effect of weightlessness on the basic components of cells, the genetic structure and energy apparatus. Genetic studies were made on the Drosophila melanogaster. Experiments were made on higher vegetation and fungi as well. The results indicate that weightlessness cannot be the principal barrier for normal development. An experiment with ectopic osteogenesis in weightlessness was carried out. Measurements were made of cosmic radiation inside and outside the biosatellite. G.G.

N79-14712# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE APPLICATION OF REMOTE SENSORS TO A MODEL FOR FISH MAPPING [O SENSORIAMENTO REMOTO APLICADO A UM MODELO DE CARTAS DE PESCA]

Sydnea Maluf Oct. 1978 12 p refs In PORTUGUESE, ENGLISH summary Presented at the 5th Simp. Latinoam. sobre Oceanog. Biol., Sao Paulo, Brazil, 20-25 Nov. 1978

(INPE-1379-PE/176) Avail: NTIS HC A12/MF A01

A methodology for the determination of the best potential fishing zones, for sardines, in the Brazilian coastal area of the southwestern tropical Atlantic Ocean, between latitudes 21 deg 45'S and 25 deg 00'S and longitudes 40 deg 50'W and 47 deg 00'W is presented. A fishing chart model was developed from observations relative to the months of July, August, September, November and December. Marine fishing charts containing such zones are presented for the September month. The potentiality of the VHRR-IR and the surface charts of NOAA's satellite in determinating fishing zones is demonstrated. G.G.

N79-14713# Kentucky Univ., Lexington.

DYNAMIC RESPONSE OF VERTEBRAL ELEMENTS RELATED TO USAF INJURY Final Report, 1 Jan. - 31 Dec. 1977

J. F. Lafferty Feb. 1978 27 p refs

(Contract F49620-77-C-0043)

(AD-A059489; AFOSR-78-1261TR) Avail: NTIS HC A03/MF A01 CSCL 06/5

Test specimens obtained from fresh-frozen Rhesus vertebral columns are used to determine shear load distribution and stress-strain characteristics of the facets relative to the soft tissue. The specimens consist of two vertebrae and the intervening disc with the longitudinal ligaments intact. Results of the initial tests show that at the onset of shear stress, the facets sustain from 60 percent to 80 percent of the load; with increasing shear force the fraction of the load carried by the disc and ligaments increases to 50-60 percent. Failure of the facets resulted from bilateral fracture of the inferior facets at the margin. Without facets, failure typically occurs due to separation of the end plates from the vertebral body. The tests indicate that failure sequence progresses through (1) facet fracture, (2) end plate separation, and (3) tearing of ligaments. Author (GRA)

N79-14714# Los Alamos Scientific Lab., N. Mex.

A PRELIMINARY TOXICOLOGICAL STUDY OF SILASTIC 386 FOAM ELASTOMER: CATALYST

D. M. Smith, G. A. Drake, J. E. London, and R. G. Thomas Jun. 1978 4 p refs

(Contract W-7405-eng-36)

(LA-7366-MS) Avail: NTIS HC A02/MF A01

The acute oral LD superscript 30 subscript 50 values in mice and rats for cured Silastic 386 (95 parts foam elastomer plus 5 parts catalyst) were greater than 5 g/kg. According to classical guidelines, the mixture would be considered slightly toxic or practically nontoxic in both species. Skin application studies in the rabbit demonstrated the mixture to be mildly irritating. Eye irritation studies, also in the rabbit, showed the cured Silastic 386 to be a mild but transitory irritant. The sensitization study in the guinea pig did not demonstrate the mixture to be a sensitizer. Author

N79-14715# Duke Univ., Durham, N. C. Medical Center.

MECHANISMS OF RECOMBINATION AND FUNCTION OF DNA IN BACTERIA Progress Report, 6 May 1976 - 31 Jul. 1977

W. R. Guild 1977 4 p refs

(Contract E(40-1)-3941)

(ORO-3941-33) Avail: NTIS HC A02/MF A01

Work centered around a detailed description and analysis of mechanisms of gene transfer and recombination in pneumococcus. In addition to the study of transformation, much effort has gone into developing and exploiting the use of bacteriophages in this species, in particular with respect to transfection and transduction. Some of the areas of progress are described. Author

N79-14716# Joint Publications Research Service, Arlington, Va.

SPACE BIOLOGY AND AEROSPACE MEDICINE, VOL. 12, NO. 6

O. G. Gazenko, ed. 21 Dec. 1978 139 p refs Transl. into ENGLISH of Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 3-82

(JPRS-72487) Copyright. Avail: NTIS HC A07/MF A01

In-flight monitoring and ground-based simulation studies on the physiological effects of manned space flight are reported. For individual titles, see N79-14717 through N79-14735.

N79-14717# Joint Publications Research Service, Arlington, Va.

DYNAMICS OF COSMONAUTS' BLOOD BIOCHEMISTRY DURING SPACE MISSIONS c52

I. S. Balakhovskiv and T. A. Orlova *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 1-8 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 3-8 (For primary document see N79-14716 05-51)

Copyright. Avail: NTIS HC A07/MF A01

The results of biochemical analyses of blood samples taken from crew members of Soyuz-11, Soyuz-14, Soyuz-17 and Soyuz-18 during missions are presented. Data were compared to the results of model experiments and background findings on these and other cosmonauts. G.G.

N79-14718# Joint Publications Research Service, Arlington, Va.

STUDIES OF HEMODYNAMICS AND PHASE STRUCTURE OF CARDIAC CYCLE IN THE CREW OF SALYUT-4 c52

V. A. Degtyarev, V. G. Doroshev, N. D. Kalmukova, Z. A. Kirillova, N. A. Lapshina, A. A. Lepskiy, and V. N. Rabozin *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 9-15 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 9-14 (For primary document see N79-14716 05-51)

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The flights of Salyut and Skylab orbital research stations initiated extensive studies of the cardiovascular system in the course of long-term weightlessness. Studies begun by the crew of Salyut and Salyut-3 stations were continued on Salyut-4. For the first time, a number of tests were made in the morning, right after the cosmonauts woke up, i.e., under conditions close to basal metabolism. A distinct lability of most hemodynamic indices was observed during the period of adaptation to earth's gravitation. G.G.

N79-14719# Joint Publications Research Service, Arlington, Va.

DYNAMIC MEDICAL MONITORING OF FLIGHT CREWS IN THE COURSE OF LONG-TERM FLIGHTS c52

V. V. Rassvetayev, A. V. Ivanov, V. A. Kolosov, V. N. Kuznetsov, and N. F. Mikhaylik *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 16-19 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 14-17 (For primary document see N79-14716 05-51)

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Results of flight crews monitoring during long-term flights establish two types of reactions of the main physiological systems during flights: reactions of functional systems in response to brief complication of professional work (emotional and motivational factors are the triggering mechanism of such reactions) and reactions resulting from the combined effect of tense work and adverse flight factors (these reactions are based on developing fatigue and relative exhaustion of body systems). G.G.

N79-14720# Joint Publications Research Service, Arlington, Va.

INVESTIGATION OF COMPOSITION OF TRACE CONTAMINANTS IN THE AIR ENVIRONMENT OF THE SOYUZ-22 SPACECRAFT **c54**

V. P. Savina, K. N. Mikos, V. Ye. Ryzhkova, A. I. Gorshunova, Yu. G. Nefedov, V. A. Akesenov, and A. A. Lepskiy *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 20-23 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 18-20 (For primary document see N79-14716 05-51)

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Air samples collected directly in flight on the Soyuz-22 spacecraft manned compartment made it possible to determine the concentrations of methane, ethane, heptane, methanol, acetaldehyde, n-propanol, ethanol, acetone, and ethylbenzene that were close to the concentrations demonstrated in mockup studies on the ground. The concentration of methane did not exceed 21.7 mg/cu m throughout the flight. The concentrations of methanol, ethanol, n-propanol and acetaldehyde were close to the levels obtained in the ground-based chamber studies. The somewhat higher concentration of acetone in the manned compartment may be related to the large amount of equipment and polymer materials in the spacecraft cabin. G.G.

N79-14721# Joint Publications Research Service, Arlington, Va.

EFFECTS OF HYPERHYDRATION ON HUMAN ENDURANCE OF ORTHOSTATIC AND LBNP TESTS **c52**

A. I. Grigoryev, B. S. Katkovskiy, A. A. Savilov, V. S. Georgiyevskiy, B. R. Dorokhova, and V. M. Mikhaylov *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 24-29 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 20-24 (For primary document see N79-14716 05-51)

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A method was developed that would be feasible in space flight practice, for raising the level of body hydration by means of intake of water and salt, directed toward maintaining resistance to orthostatic factors and lower body negative pressure (LBNP). G.G.

N79-14722# Joint Publications Research Service, Arlington, Va.

CHANGES IN HUMAN RENAL FUNCTION IN PASSIVE HEAD-UP AND HEAD-DOWN POSITIONS **c54**

A. K. Merzon and V. S. Zeligman *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 30-34 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 25-28 (For primary document see N79-14716 05-51)

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The decrease in renal excretion of sodium and fluid in passive orthostatic position interpreted as a homeostatic reaction to acute migration of blood to the lower part of the body, with decrease in blood supply to organs above the level of the heart. This reaction occurs with the involvement of both neurohumoral and hormonal influences on the kidneys, and its purpose is to speedily restore the intravascular volume. The kidneys play the role of a vascular buffer, since additional amounts of blood are diverted into the systemic circulation from their vessels as a result of vasoconstriction. The increase in renal retention of sodium and fluid is also involved in increasing the intravascular volume. G.G.

N79-14723# Joint Publications Research Service, Arlington, Va.

STABILITY OF CIRCADIAN SYSTEM OF THE BODY **c52**

S. I. Stepanova *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 35-42 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 28-34 (For primary document see N79-14716 05-51)

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The dynamics of changes in the structure of pilot activity were monitored while piloting an aircraft in the presence of hypoxia. Stability of acrophases and para-acrophases on a time scale is found to be a good criterion of constancy of circadian rhythm. The interval within which the position of the phase fluctuates from day to day is called the wandering (walk) zone of this phase. The wider the zone, the less stable the position of the phase on the time scale. A narrow walk zone is indicative of stable position of the phase on the local time scale. G.G.

N79-14724# Joint Publications Research Service, Arlington, Va.

DYNAMICS OF IMPAIRMENT OF PILOT PERFORMANCE IN THE PRESENCE OF HYPOXIA **c52**

V. V. Lapa and G. M. Chernyakov *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 43-48 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 34-38 (For primary document see N79-14716 05-51)

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It is shown that disturbances in pilot performance under hypoxic conditions, corresponding to altitudes of up to 5600 m, develop gradually and have a complex genesis. Central mechanisms of the functional system that regulates movements are the first to be impaired. Then changes appear in distribution and switching of attention. Complex forms of thinking processes were found to be the most resistant to hypoxia. G.G.

N79-14725# Joint Publications Research Service, Arlington, Va.

COMBINED EFFECT OF HYPEROXIA, LOW PRESSURE AND EXERCISE ON THE RATE OF METHYLKETONE EXCRETION FROM THE HUMAN BODY **c52**

A. V. Sedov, G. A. Gaziyev, N. A. Surovtsev, G. Ye. Mazneva, O. N. Shevkun, A. N. Ivanov, L. I. Kobzeva, G. A. Ryakhovskaya, and L. A. Popova *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 49-53 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 39-42 (For primary document see N79-14716 05-51)

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It is established that exposure of albino rats to an atmosphere of 96% oxygen PO2 729 mm Hg) for 2 days at normal barometric pressure does not have an appreciable effect on elimination of ketones from the organism; 1.5 days of restricted movement also fails to influence ketone excretion. At the same time, the combination of hyperoxia and hypokinesia accelerates methylketone excretion. A significant increase in rate of excretion of methylketones was observed in exhaled air under the combined influence of hyperoxia, low barometric pressure and physical exercise. Evidently, the increased rate of methylketone excretion under the influence of the above-mentioned factors may be an indirect indication of changes in fat and carbohydrate metabolism. G.G.

N79-14726# Joint Publications Research Service, Arlington, Va.

PRINCIPAL RESULTS OF EXPERIMENT WITH MAMMALS ONBOARD THE KOSMOS-782 BIOSATELLITE

O. G. Gazenko, A. M. Genin, Ye. A. Ilin, V. V. Portugalov, L. V. Serova, and R. A. Tigranyan *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 54-63 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 43-49 (For primary document see N79-14716 05-51)

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The results of physiological, morphological and biochemical studies conducted after the experiment confirmed the previous conclusions that mammals can adapt to prolonged (19.5 days) weightlessness, and that there are no pathological changes in main vital organs and tissues under such conditions. G.G.

N79-14727# Joint Publications Research Service, Arlington, Va.

SPERMATOGENESIS IN DOGS DURING MANY YEARS OF CHRONIC EXPOSURE TO GAMMA RADIATION AND IN THE AFTEREFFECT PERIOD

G. I. Plakhuta-Plakutina *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 64-70 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 50-55 (For primary document see N79-14716 05-51)

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The morphological changes in canine reproductive glands were studied after continuous exposure to gamma radiation for several years at a low dose rate. Obtained data confirm the possibility of restoration of spermatologenesis in dogs at the long term following chronic exposure to gamma radiation at different dose rates. G.G.

N79-14728# Joint Publications Research Service, Arlington, Va.

DNA CONTENT OF ANIMAL ORGANS DURING SPACE FLIGHT ON KOSMOS-690 SATELLITE

F. T. Guseynov, G. S. Komolova, I. A. Yegorova, R. A. Tigranyan, and L. V. Serova *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 71-76 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 55-59 (For primary document see N79-14716 05-51)

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The DNA levels in the liver, spleen and bone marrow of rats were studied following exposure to gamma-radiation during a flight aboard the Kosmos-960 satellite. The assays of DNA in animal organs at longer terms confirm the hypothesis that space flight conditions enhance the radiation effect, and this could be due to retardation of recovery processes. G.G.

N79-14729# Joint Publications Research Service, Arlington, Va.

STATE OF BLOOD CLOTTING DURING PROLONGED HYPOKINESIA c52

L. P. Sviridkina *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 77-81 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 59-63 (For primary document see N79-14716 05-51)

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The animals developed hypercoagulation under the influence of 14 days of hypokinesia, followed by relative hypocoagulemia by the 30th day. G.G.

N79-14730# Joint Publications Research Service, Arlington, Va.

THE COMBINED EFFECT OF CARBON MONOXIDE AND NORMOBARIC HYPEROXIA ON ANIMALS

B. I. Abidin, V. I. Belkin, V. V. Kustov, and A. N. Kondratyev *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 82-87 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 63-67 (For primary document see N79-14716 05-51)

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The combined effect on the organism of carbon monoxide in a concentration of 50.0 + or - 2.0 mg/cu m, and an artificial gas environment with elevated partial oxygen pressure, with continuous exposure for 30 days, is characterized by antagonism of their biological effects, with some prevalence of the influence of the latter over that of carbon monoxide. It is concluded that maximum permissible concentrations of each factor can be used, when an organism is exposed to both simultaneously, without any correction of these concentrations. G.G.

N79-14731# Joint Publications Research Service, Arlington, Va.

BLOOD LIPID CHANGES IN HYPOXIC RATS

G. A. Gribanov, S. A. Sergeyev, and A. S. Aleksenko *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 88-93 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 67-71 (For primary document see N79-14716 05-51)

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Analyses of total lipids (TL) and other blood serum components of hypoxic rats revealed certain changes, manifested by the tendency toward decrease of TL with redistribution of lipid components in both absolute and relative values. This was evidently due to increase in activity of some hydrolytic enzyme systems, the ultimate effect of which was an increase in DG, FFA, C, LPD and other components. The changes in proportion of lipid fractions were closely related to the qualitative and quantitative changes in LP, and first of all in beta- and pre-beta-LP. The increase in inorganic phosphate of blood serum in the presence of hypoxia may be indicative of both an increase in breakdown of phosphorus-containing organic compounds in blood and tissues (with the exception of blood serum PL), and migration thereof into the vascular stream from different organs under the acute effect of the hypoxia factor. G.G.

N79-14732# Joint Publications Research Service, Arlington, Va.

EFFECT OF INTERMITTENT HYPOXIA ON FUNCTIONAL ACTIVITY OF PERIPHERAL BLOOD NEUTROPHILS c52

N. A. Luchinina *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 97-101 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 73-76 (For primary document see N79-14716 05-51)

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Chronic, intermittent hypoxia induced phasic changes in functional activity of leukocytes, the nature of which is largely determined by the time of exposure of the organism. G.G.

N79-14733# Joint Publications Research Service, Arlington, Va.

EFFECT OF CEREBROCRANIAL TRAUMA ON REACTIVE DISTINCTIONS OF HYPOTHALAMIC AND HIPPOCAMPAL VESSELS IN THE PRESENCE OF HYPOXIA c52

Yu. N. Orestenko and N. M. Kovalev *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 102-107 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 76-79 (For primary document see N79-14716 05-51)

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Reactive changes in blood supply and tonus of vessels of the anterior hypothalamus and dorsal hippocampus were observed in the course of development of altitude hypoxia, before and after determinate closed cerebrocranial trauma. These studies demonstrated the reactive distinctions of hypothalamic and hippocampal vessels in response to hypoxic hypoxia before and after closed cerebrocranial trauma, as well as in response to the trauma itself. There were independent mechanisms of regulation of circulation and tonus in these structures, which serve as a manifestation of local regulatory influences. As compared to the hippocampus, the hypothalamus is a more reactive, but also stable structure of the brain when the organism is exposed to extreme factors (hypoxia, cerebrocranial trauma). G.G.

N79-14734# Joint Publications Research Service, Arlington, Va.

ROLE OF VESTIBULAR SYSTEM IN BEHAVIOR OF ANIMALS SUBMITTED TO PROLONGED SLOW ROTATION

G. I. Gorgiladze *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 108-110 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 79-80 (For primary document see N79-14716 05-51)

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It is shown that animals placed in a ground-based rotating system choose the center of rotation, and that such behavior is controlled by the vestibular system. On the other hand, when rotated in weightlessness rats strive toward the periphery rather than the center of rotation. These facts should probably be interpreted as follows: In the former case, the animals get rid of excessive stimulation of vestibular receptors, whereas during rotation in weightlessness, as they move from the center of rotation to the field of greater accelerations, they try to compensate for the shortage of impulsation from the otolith system. G.G.

N79-14735# Joint Publications Research Service, Arlington, Va.

EFFECT OF PSYCHOPHYSIOLOGICAL SELF-REGULATION ON EMOTIONAL STABILITY OF AVIATION CADETS IN FLIGHT AND ON EFFECTIVENESS OF ASSIMILATION OF FLIGHT TRAINING PROGRAM **c53**

V. S. Lozinskiy *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 111-114 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), V. 12, no. 6, 1978 p 80-82 (For primary document see N79-14716 05-51)

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Methods of psychophysiological self-regulation for exerting a deliberate influence on emotional stability of cadets and for improving assimilation of flight training programs, were studied. The results obtained indicate that psychophysiological self-regulation is an effective means for increasing emotional stability of student pilots under extreme flying conditions. This method can be used to upgrade the quality of flight training. G.G.

N79-14736# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 53. EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION

12 Jan. 1979 56 p refs Transl. into ENGLISH from various Russian articles

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The effects of sy superhigh frequency electromagnetic radiation on biological activity are examined from observations of human erythrocytes and the liver and brain tissue of rats. The therapeutic aspects of magnetic fields and their clinical application are reviewed. For individual titles, see N79-14737 through N79-14744.

N79-14737# Joint Publications Research Service, Arlington, Va.

INVESTIGATION OF THE ACTIVITY OF SOME ENZYMATIC SYSTEMS IN RESPONSE TO A SUPER-HIGH FREQUENCY ELECTROMAGNETIC FIELD **c52**

Yu. D. Dumanskiy, L. A. Tomashevaskaya, and A. N. Marzeyev *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 1-7 refs Transl. into ENGLISH from Gigiena i Sanit. (Moscow), No. 8, 1978 p 23-27 (For primary document see N79-14736 05-51)

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The influence of different levels of superhigh frequency (SHF) energy on some enzymatic processes in subcellular reactions of the brain of white rats was investigated. Results indicate that the biological effects of SHF fields with PFD's of 100 and 1,000 micron w/sq cm are accompanied by a certain complex of biochemical changes reflecting disturbances in the body's metabolism when it is exposed to such fields for a long period of time. These are a decline in cytochrome oxidase activity in mitochondria, an increase in G-6-PHD activity in liver and brain hyaloplasm, and activation of mixed function oxidase in the microsomal fraction of rat liver. The noted changes were unidirectional in nature in response to different PFD's. Maximum deviations were observed basically following one month of irradiation; as the exposure time was increased, the expressiveness of the changes weakened somewhat. A.R.H.

N79-14738# Joint Publications Research Service, Arlington, Va.

EFFECTS OF INTERMITTENT MAGNETIC FIELD ON ACTIVITY OF CARBOHYDRATE METABOLISM ENZYMES AND OXYGEN UPTAKE IN TESTICULAR TISSUE **c52**

N. A. Udintsev and S. M. Khlynin *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 8-13 refs Transl. into ENGLISH from Ukr. Biokhim. Zh. (Kiev), no. 6, 1978 p 714-717 (For primary document see N79-14736 05-51)

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Testicular tissue from male albino rats put in the interpolar space of a 200 Oe magnet with a gradient of not more than 5% and frequency of 50 Hz, once for 24 h and several times for 6.5 h per day for 5 days were examined. Single exposure to the field for one day was found to increase glucose-6-phosphate dehydrogenase activity. Diminution is appreciable 24 to 28 hours after exposure to the field, as is that of cytochromozidase and hexokinase activity in mitochondria. There is an increase in lactate hydrogenase and succinate dehydrogenase activity. A return to the base level is observed on the 7th to the 14th day. In the case of multiple exposure, there is no stimulation; enzyme activity diminishes (with the exception of that of lactate dehydrogenase.) These changes are consistent with the dynamics of testerone level in plasma and the testes. A.R.H.

N79-14739# Joint Publications Research Service, Arlington, Va.

EFFECTS OF MICROWAVES ON CATECHOLAMINE METABOLISM IN THE BRAIN **c52**

A. N. Grin *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 14-16 refs Transl. into ENGLISH from Vrachebnoe Delo (Kiev), no. 10, 1978 p 129-130 (For primary document see N79-14736 05-51)

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One hundred thirty-two male albino rats weighing 180 to 450 g, were exposed daily to continuous superhigh frequency fields with energy flux, density of 500 and 50 micron W/sq cm. Duration of daily exposure constituted 7 h per day for 1 month. In addition, in order to assess the role not only of intensity, but duration of radiation, in biological changes in the brain, the rats were examined on the 5th, 10th, 20th and 30th days. A Luch-2 (12.6 cm wavelength) unit was used to irradiate the rats. An EF-ZMA unit with attachment was used for fluorimetric assay of epinephrine, norepinephrine, dopamine, and dopa. Changes in catecholamine levels in the brain as related to microwave irradiation are listed in tables.

N79-14740# Joint Publications Research Service, Arlington, Va.

EFFECTS OF ELECTROMAGNETIC FIELD INDUCTION ON DEVELOPMENT OF THE GREEN ALGAE, SCENEDESMUS QUADRICAUDA (TURBPIN) BREB. AND COMPOSITION OF FREE AMINO ACIDS IN ITS BIOMASS AND MEDIUM **c51**

K. K. Yankyavichyus, S. F. Budrene, and R. I. Razyulite *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 17-26 refs Transl. into ENGLISH from Tr. Akad. Nauk Lit. SSR Ser. B (Vilnius), no. 4, p 121-129 (For primary document see N79-14736 05-52)

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Changes in the qualitative and quantitative composition of free amino acids and accumulation of biomass in a bacteriologically pure culture of Scenedesmus quadricauda (Turpin) Breb. green algae under the influence of magnetic field induction (EMFI) revealed that magnetization of the medium in flux without algae (with later algae addition), at EMFI of 0.015, 0.030, 0.126, 0.385, 0.530, 0.970, and 1200 wb/sq m, stimulated development of algae and elicited a quantitative change in free amino acids in their biomass and in the medium. Premagnetization of the medium without the algae in static position, at low levels (0.005 and 0.025 Wb/sq m) had a stimulating effect on development of algae and reduced concentration of amino acids in the biomass. Premagnetization of the medium without algae in flux, at all indicated EMFI levels, and of medium without algae in static position at low EMFI levels, apparently stimulates incorporation of free amino acids in proteins. A.R.H.

N79-14741# Joint Publications Research Service, Arlington, Va.

DEPENDENCE OF THE FUNCTIONAL ACTIVITY OF LIVER MITOCHONDRIA ON MICROWAVE RADIATION **c52**

Yu. D. Dumanskiy and V. F. Rudichenko *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 27-32 refs Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), No. 4, 1976 p 16-19 (For primary document see N79-14736 05-51)

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Forty-two white rats were irradiated with microwave energy with various power flux densities three times a day, five days a week, over a four month period. The activity of the mitochondria in various functional states was determined by the pologtaphic

method. The effect of the microwave radiation on the oxygen uptake and phorphorylation of live mitochondria during the oxidation of succinate is discussed. A.R.H.

N79-14742# Joint Publications Research Service, Arlington, Va.

STATE OF PROCESS OF OXIDATION PHOSPHORYLATION OF LIVER MITOCHONDRIA ON EXPOSURE TO AN ELECTRIC FIELD c52

I. P. Kozyarin and V. F. Rudichenko *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 33-57 refs Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 11, 1978 p 26-29 (For primary document see N79-14736 05-51)

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The effect of industrial frequency electric field (IFEF) on the principal metabolic pathways was investigated in male white rats. Results indicate that prolonged exposure to IFEF causes a reduction in the content of copper and iron in the liver tissue. The reduction in the level of copper was characterized by identical values among the animals exposed to IFEF with an intensity of 1 to 2 kv/min and a considerable reduction in the level of the biotics when the field intensity was 4,7, and 15 kv/min. The iron content in the liver was characterized by somewhat different relationships. When exposed to IFEF with an intensity of 1 to 2 kv/min, a considerable reduction was observed in the iron content in the liver. With an increase in the field intensity to 7 and 15 kv/min, the tendency towards reduction in the iron content, depending on the field intensity, was less marked. With succinate oxidation, an intensification was observed in the phosphorylating respiration in animals exposed to IFEF intensity of 4 to 7 kv/min. Stimulation of the phosphorylating respitation, with an increase in the field intensity of 15 kv/min, was replaced by inhibition in this process. A.R.H.

N79-14743# Joint Publications Research Service, Arlington, Va.

MECHANISM OF EFFECTS OF MICROWAVES ON ERYTHROCYTE PERMEABILITY FOR POTASSIUM AND SODIUM IONS c52

E. Sh. Ismailov *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 38-41 refs Transl. into ENGLISH from Biol. Nauki (USSR), no. 3, 1971 p 58-60 (For primary document see N79-14736 05-51)

Avail: NTIS HC A04/MF A01

Exposure to microwaves appreciably alters the permeability of human erythrocytes for potassium and sodium ions. These ions migrate between the cell and medium over a concentration gradient. Erythrocyte permeability for K(+) and Na(+) changes under the influence of microwaves due to inhibition of active transport thereof and change in diffusion through pores in the membrane. The latter may be due to the effect of UHG energy on both the membrane proper and hydrate membrane of sodium and potassium ions. Author

N79-14744# Joint Publications Research Service, Arlington, Va.

DETERMINATION OF A GENERALIZED OUTPUT INDEX OF A BIOLOGICAL EXPERIMENT AFTER MULTIPLE TESTS c52

I. P. Los and A. M. Serdyuk *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 42-48 refs Transl. into ENGLISH from Vrachebnoe Delo (Kiev), no. 6, 1975 p 113-117 (For primary document see N79-14736 05-51)

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Particular difficulties encountered in studying the biological activity of certain physical factors such as electromagnetic fields, noise, vibration, and experimental conditions on a factor-organism model can be solved by using a mathematical plan of the experiment. The psychophysical concept of desirability scales is applied to obtain a generalized index consideration not only for its statistical sensitivity and effectiveness, but also for its acceptability in solving the problem of the selection of adequate tests and criteria for evaluating deviations. A formula is given for transforming the individual responses obtained in each test into a dimensionless scale which is subsequently converted to a generalized index. Equal biological significance of the scales, determined by the variation factor of the indexes on which the determination of the scale specifications is based, makes it possible to select tests which are sensitive and adequate to a given factor by the method of comparison. A.R.H.

N79-14745# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 51

10 Jan. 1979 76 p refs Transl. into ENGLISH from various Russian journals

(JPRS-72588) Copyright. Avail: NTIS HC A05/MF A01

Various Soviet news releases are presented. The replacement of heart valves, visual discrimination in data processing, and carbon monoxide release by humans in protective clothing are reported. For individual titles, see N79-14746 through N79-14748.

N79-14746# Joint Publications Research Service, Arlington, Va.

FUNCTIONAL OUTCOMES OF PROSTHETIC CARDIAC VALVE REPLACEMENT c52

N. M. Amosov, Ya. A. Bendet, N. M. Verich, M. Yu. Atamanyuk, G. V. Knyshov, N. G. Cherkashina, and V. M. Khandoga *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 51 (JPRS-72588) 10 Jan. 1979 p 1-10 refs Transl. into ENGLISH from Grud. Khir. (Moscow), no. 5, 1978 p 3-8 (For primary document see N79-14745 05-51)

Copyright. Avail: NTIS HC A05/MF A01

The experience of 1,625 operations and the remote results of 930 patients showed that prosthetic cardiac valve replacement ensured satisfactory results in heart defect patients. A comparative study in dynamics of the physical state and work fitness of 120 patients, using submaximal load tests, are reviewed. J.A.M.

N79-14747# Joint Publications Research Service, Arlington, Va.

VISUAL INFORMATION PROCESSING c53

T. P. Zinchenko *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 51 (JPRS-72588) 10 Jan. 1979 p 11-20 refs Transl. into ENGLISH from Tekh. Estetika (Moscow), no. 10, 1978 p 9-12 (For primary document see N79-14745 05-51)

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The purpose of the research was to study the processes involved in visual information processing during recognition, classification, and visual search. The perception experiment of one and multidimensional stimuli was directed to relevant and irrelevant parameter effects on recognition. The possibilities of filtration and blocking of irrelevant information during classification of one and multidimensional stimuli were also examined. J.A.M.

N79-14748# Joint Publications Research Service, Arlington, Va.

LIBERATION OF CARBON MONOXIDE BY MAN WHEN WORKING IN PROTECTIVE GEAR c54

A. V. Sedov, G. A. Gaziyev, G. Ye. Mazneva, N. A. Surovtsev, L. I. Kobzeva, and O. N. Shevkun *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 51 (JPRS-72588) 10 Jan. 1979 p 33-36 refs Transl. into ENGLISH from Gig. Sanit. (Moscow), no. 8, 1978 p 107-108 (For primary document see N79-14745 05-51)

Copyright. Avail: NTIS HC A05/MF A01

The effective disposal of carbon monoxide released by the human body within protective clothing was studied. Subjects performed physical work of varying difficulty, requiring energy outlays of 400 and 600 kcal/hr while breathing pure oxygen in low barometric pressure. As the size of the load increased, the intensity of CO libration from both smokers and nonsmokers increased. When the physical load is increased by 200 kcal/hr, the rate of CO release doubles. J.A.M.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N79-14748* National Aeronautics and Space Administration. Pasadena Office, Calif.

GAS DIFFUSION LIQUID STORAGE BAG AND METHOD OF USE FOR STORING BLOOD Patent

Herman Bank (JPL) and Edward L. Cleland, inventors (to NASA) (JPL) Issued 2 Jan. 1979 5 p Filed 28 Jun. 1976 Supersedes N78-25760 (16 - 16, p 2164) Sponsored by NASA (NASA-Case-NPO-13930-1; US-Patent-4,132,594; US-Patent-Appl-SN-700467; US-Patent-Class-195-1.8; US-Patent-Class-422-41; US-Patent-Class-422-48; US-Patent-Class-55-15-8; US-Patent-Class-128-214D; US-Patent-Class-128-272; US-Patent-Class-150-1; US-Patent-Class-206-439; US-Patent-Class-210-DIG.23) Avail: US Patent and Trademark Office CSCL 06B

The shelf life of stored whole blood may be doubled by adding a buffer which maintains a desired pH level. However, this buffer causes the generation of CO2 which, if not removed at a controlled rate, causes the pH value of the blood to decrease, which shortens the useful life of the blood. A blood storage bag is described which permits the CO2 to be diffused out at a controlled rate into the atmosphere, thereby maintaining the desired pH value and providing a bag strong enough to permit handling. Official Gazette of the U.S. Patent and Trademark Office

N79-14750* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

DETERMINATION OF ANTIMICROBIAL SUSCEPTIBILITIES ON INFECTED URINES WITHOUT ISOLATION Patent

Grace L. Picciolo, Emmett W. Chappelle, Jody W. Deming (New England Medical Ctr., Boston, Mass.), Christian G. Shrock (New England Med. Ctr., Boston, Mass.), Hillar Vellend (New England Med. Ctr., Boston, Mass), Michael J. Barza (New England Med. Ctr., Boston, Mass.), and Louis Weinstein, inventors (to NASA) (New England Med. Ctr., Boston, Mass.) Issued 2 Jan. 1979 7 p Filed 23 Apr. 1976 Supersedes N77-26797 (15 - 17, p 2306) Sponsored by NASA (NASA-Case-GSC-12046-1; US-Patent-4,132,599; US-Patent-Appl-SN-680015; US-Patent-Class-195-103.5K; US-Patent-Class-195-103.5L) Avail: US Patent and Trademark Office CSCL 06A

A method is described for the quick determination of the susceptibilities of various unidentified bacteria contained in an aqueous physiological fluid sample, particularly urine, to one or more antibiotics. A bacterial adenosine triphosphate (ATP) assay is carried out after the elimination of non-bacterial ATP to determine whether an infection exists. If an infection does exist, a portion of the sample is further processed, including subjecting parts of the portion to one or more antibiotics. Growth of the bacteria in the parts are determined, again by an ATP assay, to determine whether the unidentified bacteria in the sample are susceptible to the antibiotic or antibiotics under test.

Official Gazette of the U.S. Patent and Trademark Office

N79-14751* National Aeronautics and Space Administration. Pasadena Office, Calif.

COUPLING APPARATUS FOR ULTRASONIC MEDICAL DIAGNOSTIC SYSTEM Patent

Robert E. Frazer, inventor (to NASA) (JPL) Issued 19 Dec. 1978 5 p Filed 15 Nov. 1976 Supersedes N78-25761 (16 - 16, p 2164) Sponsored by NASA (NASA-Case-NPO-13935-1; NASA-Case-NPO-13944-1; US-Patent-4,130,112; US-Patent-Appl-SN-741749; US-Patent-Class-128-2V; US-Patent-Class-73-633; US-Patent-Class-73-644) Avail: US Patent and Trademark Office CSCL 06B

An apparatus for the ultrasonic scanning of a breast or other tissue is reported that contains a cavity for receiving the breast, a vacuum for drawing the breast into intimate contact with the walls of the cavity, and transducers coupled through a fluid to the cavity to transmit sound waves through the breast. Each transducer lies at the end of a tapered chamber which has flexible walls and which is filled with fluid, so that the transducer can be moved in a raster pattern while the chamber walls flex accordingly, with sound transmission always occurring through the fluid. Official Gazette of the U.S. Patent and Trademark Office

N79-14752* National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES. SUPPLEMENT 187

Dec. 1978 81 p (NASA-SP-7011(187)) Avail: NTIS HC E03 CSCL 06E

This supplement to Aerospace Medicine and Biology lists 247 reports, articles and other documents announced during November 1978 in Scientific and Technical Aerospace Reports (STAR) or in International Aerospace Abstracts (IAA). In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Emphasis is placed on applied research, but reference to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. G.Y.

N79-14753# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY. BIOMEDICAL AND BEHAVIORAL SCIENCE, NO. 54

18 Jan. 1979 96 p refs Transl. into ENGLISH from various Russian Journals (JPRS-72650) Copyright. Avail: NTIS HC A05/MF A01

Investigations on environment pollution and physiological effects are described. For individual title, see N79-14754.

N79-14754# Joint Publications Research Service, Arlington, Va.

CHEMICALS IN ENVIRONMENT AFFECT MAN'S PHYSIOLOGY

T. I. Bonashevskaya *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 54 (JPRS-72650) 18 Jan. 1979 p 60-74 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, 1978 p 44-52 (For primary document see N79-14753 05-52) Copyright. Avail: NTIS HC A05/MF A01

The role of chemical contaminants of the environment in the development of disease is discussed. The problems of establishing criteria for normal and pathological states are considered. Results indicate that the normal state is extremely dynamic with a wide range of fluctuations. Methods of investigation used include physiology, biochemistry, and morphology. A specific study done on the effects of benzene inhalation on the livers of rats is described and the results are discussed. S.B.S.

N79-14755*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

INDOMETHACIN-ANTIHISTAMINE COMBINATION FOR GASTRIC ULCERATION CONTROL Patent Application

Patricia A. Brown (San Jose State Univ., Calif.) and Joan Vernikos-Danellis, inventors (to NASA) Filed 29 Dec. 1978 19 p (NASA-Case-ARC-11118-2; US-Patent-Appl-SN-974476) Avail: NTIS HC A02/MF A01 CSCL 06E

Gastric ulcers caused by the ingestion of indomethacin by subjects under stress are significantly reduced by administering to the subjects, together or in sequence, such antihistaminic drugs as pyrilamine, promathazine, metiamide, or cimetidine. The dosages may range from 25 to 200 mg daily for the indomethacin and from 200 mg to 1.5 g daily for the antihistamine. NASA

N79-14756*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

PROSTHETIC URINARY SPHINCTER Patent Application

Curtis R. Helms and Harold M. Smyly, inventors (to NASA) Filed 12 Oct. 1978 11 p (NASA-Case-MFS-23717-1; US-Patent-Appl-SN-950877) Avail:

NTIS HC A02/MF A01 CSCL 06B

A pump/valve unit which requires a minimum of implant area and surgery is described for controlling bladder function by regulating the inflation and deflation of a urethral collar in a prosthetic urinary sphincter device. The pump has a press bulb of silicone elastomer which provides a reservoir for fluid solution. The valve unit includes a movable member which operates by depression of a flexible portion of the valve unit housing in order to control fluid flow between the reservoir and the collar. A pressure sensing means operates the valve member in order to relieve excess pressure in the collar should too much pressure be applied by the patient. NASA

N79-14757# Royal Aircraft Establishment, Farnborough (England).

THE PHYSIOLOGICAL SIGNIFICANCE OF LIGHT FOR HUMAN BEINGS

F. Hollwich, B. Dieckhues, and C. O. Meiners Jun. 1978 26 p refs Transl. into ENGLISH from Lichttechnik (West Ger.), v. 27, no. 10, 1975 p 388-394

(RAE-Lib-Trans-1976; BR65200) Avail: NTIS HC A03/MF A01

Over the many thousands of years of its development, the human eye has completely adapted itself to natural daylight. Artificial lighting, however, to which many of us are exposed for the major part of the day, differs from natural daylight as regards spectral composition, intensity and monotony. This paper discusses the physiological effects of artificial lighting on man on the basis of experimental and clinical investigations on humans and animals. Author

N79-14758# Royal Aircraft Establishment, Farnborough (England).

INVESTIGATIONS INTO THE IMPORTANCE OF THE DIRECTION OF CENTRIFUGAL FORCES ACTING ON THE HUMAN BODY

L. Buehrlen Oct. 1977 31 p refs Transl. into ENGLISH from Luftfahrtmedizin (Ger.), v. 1, 1937 p 307-325

(RAE-Lib-Trans-1945; BR66016) Avail: NTIS HC A03/MF A01

Centrifugal force tests were carried out on men in sitting and lying positions. The centrifugal measurement was carried out to an accuracy of within a few per cent by means of the optical recording of the speed of rotation of the centrifuge. In the sitting position, the same phenomena were observed as those familiar from flight practice. Prolonged acceleration forces above 5 g led to disturbances of vision. In the lying position, no troublesome disturbances were noted up to 10 g; above 10 g breathing became considerably more labored and from 15 g upwards, almost impossible. At 14-15 g, disturbances of vision occurred, although the brain and consciousness were in no way affected. Author

N79-14759# Bureau of Radiological Health, Rockville, Md. Div. of Electronic Products.

ELECTROMAGNETIC FIELDS IN BIOLOGICAL MEDIA. PART 1: DOSIMETRY - A PRIMER ON BIOELECTROMAGNETICS Final Report

Stanley M. Neuder Jul. 1978 32 p refs

(PB-285793/6; FDA/BRH-78/128-Pt-1; DHEW/PUB/FDA-78/8068-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 06R

Microwave and radiofrequency dosimetry, the determination of microwave and radiofrequency energy deposition in biological bodies, are discussed in terms of basic mathematical and physical considerations of electromagnetic interaction with biological systems. The electrical characteristics of the biological medium are mathematically related to the electromagnetic field properties. Variations of biological characteristics and internal field behavior as a function of exposure field frequency are discussed. Dosimetry aspects are stressed in terms of power absorption during field exposures. GRA

N79-14760# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 52

12 Jan. 1979 107 p refs Transl. into ENGLISH from various Russian journals

(JPRS-72604) Copyright. Avail: NTIS HC A06/MF A01

Various planning methods applicable to scientific medical research are discussed. Problem-oriented program approach, principles of automation, systems analytic approach, and classification of biomedical data for information retrieval systems are among the topics covered. For individual titles, see N79-14761 through N79-14767.

N79-14761# Joint Publications Research Service, Arlington, Va.

A COMPLEX SYSTEM FOR PLANNING SCIENTIFIC MEDICAL RESEARCH

A. M. Chernukh, G. V. Pogodayev, and B. V. Morozov *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 52 (JPRS-72604) 12 Jan. 1979 p 25-30 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 9, 1978 p 3-7 (For primary document see N79-14760 05-52)

Copyright. Avail: NTIS HC A06/MF A01

Formation of a standard plan of scientific research on the basis of comprehensive analysis and subsequent evaluation of the future development of different directions of medical science, combining them with one another and other branches of science and technology is discussed. Emphasis is placed on the improvement of the system of planning and coordination of scientific research. J.M.S.

N79-14762# Joint Publications Research Service, Arlington, Va.

PROBLEM-ORIENTED PROGRAM APPROACH TO PLANNING AND MANAGEMENT OF MEDICINE

A. M. Chernukh, A. B. Petrovskiy, and O. V. Filippov *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 52 (JPRS-72604) 12 Jan. 1979 p 31-38 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 9, 1978 p 8-14 (For primary document see N79-14760 05-52)

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The ways and means of organizing and managing medical science in the USSR are considered in terms of intensification of the special purpose or problem-oriented aspect of planning scientific research. Advantages of the method of special purpose programmed planning are listed along with problems that could be developed on the basis of the special purpose programmed approach. J.M.S.

N79-14763# Joint Publications Research Service, Arlington, Va.

NEW PRINCIPLES OF AUTOMATION OF BIOMEDICAL RESEARCH

V. P. Kaznacheyev, M. B. Shtark, Yu. K. Postoyenko, A. A. Kiselev, and V. N. Burakovskiy *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 52 (JPRS-72604) 12 Jan. 1979 p 39-53 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 9, 1978 p 14-26 (For primary document see N79-14760 05-52)

Avail: NTIS HC A06/MF A01

The application of automation and computer technology to the development of modern biomedical research is discussed. The selection of the appropriate general purpose processing equipment in the form of a particular class of computer and a set of peripherals that link the object or experimenter directly to the computer is emphasized. The organization of the SAMBI system is given including its main elements and functions. Control algorithms which implement real time control of the heart rhythm, arterial pressure, central venous pressure, and respiratory rhythm are described. J.M.S.

N79-14764# Joint Publications Research Service, Arlington, Va.

THE CONCEPTION OF THE SYSTEMS ANALYTIC APPROACH TO PLANNING AND ORGANIZATION OF MEDICAL SCIENTIFIC RESEARCH

S. A. Gasparyan *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 52 (JPRS-72604) 12 Jan. 1979 p 54-60 refs Transl. into ENGLISH from Vestn. Aka. Med. Nauk SSSR (Moscow), no. 9, 1978 p 26-30 (For primary

document see N79-14760 05-52)
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The need to develop a classification of medical problems is addressed. Specifically, six classes of scientific medical problems are discussed in terms of planning and organization of medical science research. J.M.S.

N79-14765# Joint Publications Research Service, Arlington, Va.

CURRENT STATUS AND PROSPECTS OF CONTINUED REFINEMENT OF PLANNING AND COORDINATION OF SCIENTIFIC MEDICAL RESEARCH

A. A. Kiselev, L. Ya. Pimenova, and O. V. Filippov *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 52 (JPRS-72604) 12 Jan. 1979 p 61-70 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 9, 1978 p 30-37 (For primary document see N79-14760 05-52)
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The connection between recognized social needs and the probabilistic nature of the process of scientific search for the means to meet these needs is discussed. Emphasis is placed on the administration of financial support of biomedical research. The intensification and expansion of studies and the coordinated distribution of resources in accordance with the objective structure of social and scientific priorities are among the topics considered. J.M.S.

N79-14766# Joint Publications Research Service, Arlington, Va.

THE SYSTEMS ANALYTIC APPROACH TO THE PROBLEM OF CLASSIFICATION OF SCIENTIFIC MEDICAL RESEARCH

A. A. Kiselev, A. B. Petrovskiy, and L. A. Pimenova *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 52 (JPRS-72604) 12 Jan. 1979 p 71-81 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 9, 1978 p 38-43 (For primary document see N79-14760 05-52)
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The administration of medical science is addressed in terms of gathering and processing needed information in order to: (1) evaluate current status, trends of development, and potential of different scientific directions; (2) determine and distribute scientific potential of medicine; and (3) coordinate research with due consideration of the mutual influences of different directions, their contribution to public health practice, and solution of other national problems. Application of automated information retrieval systems to permit a multiaspect search for information needed by administrative bodies is considered with emphasis on the development of a classification system for medical science. J.M.S.

N79-14767# Joint Publications Research Service, Arlington, Va.

USE OF THE SYSTEMS ANALYTIC APPROACH FOR ORGANIZATION AND COORDINATION OF COMPLEX BIOMEDICAL RESEARCH

G. I. Mchedlishvili and M. K. Babunashvili *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 52 (JPRS-72604) 12 Jan. 1979 p 82-93 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 9, 1978 p 43-50 (For primary document see N79-14760 05-52)
Avail: NTIS HC A06/MF A01

Application of systems theory to the management and planning of biomedical research is addressed. Decision making theories applicable to problems pertaining to planning, control, and forecasting of scientific research are emphasized. J.M.S.

N79-14710# Joint Publications Research Service, Arlington, Va.

EFFECTS OF LASER RADIATION ON MORPHOLOGY OF PERIPHERAL BLOOD AND BONE MARROW UNDER EXPERIMENTAL AND CLINICAL CONDITIONS

G. V. Golovin, I. G. Dutkevich, and A. P. Sarkisyan *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 47 (JPRS-72134) 27 Oct. 1978 p 28-37 refs Transl. into ENGLISH from Vestn. Khir. (Leningrad), no. 8, 1978 p 121-126 (For primary document see N79-14708 05-51)
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N79-14717# Joint Publications Research Service, Arlington, Va.

DYNAMICS OF COSMONAUTS' BLOOD BIOCHEMISTRY DURING SPACE MISSIONS

I. S. Balakhovskiy and T. A. Orlova *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 1-8 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 3-8 (For primary document see N79-14716 05-51)
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N79-14718# Joint Publications Research Service, Arlington, Va.

STUDIES OF HEMODYNAMICS AND PHASE STRUCTURE OF CARDIAC CYCLE IN THE CREW OF SALYUT-6

V. A. Degtyarev, V. G. Doroshev, N. D. Kalmukova, Z. A. Kirillova, N. A. Lapshina, A. A. Lepskiy, and V. N. Rabozin *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 9-15 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 9-14 (For primary document see N79-14716 05-51)
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N79-14719# Joint Publications Research Service, Arlington, Va.

DYNAMIC MEDICAL MONITORING OF FLIGHT CREWS IN THE COURSE OF LONG-TERM FLIGHTS

V. V. Rassvetayev, A. V. Ivanov, V. A. Kolosov, V. N. Kuznetsov, and N. F. Mikhaylik *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 16-19 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 14-17 (For primary document see N79-14716 05-51)
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N79-14721# Joint Publications Research Service, Arlington, Va.

EFFECTS OF HYPERHYDRATION ON HUMAN ENDURANCE OF ORTHOSTATIC AND LBNP TESTS

A. I. Grigoryev, B. S. Katkovskiy, A. A. Savilov, V. S. Georgiyevskiy, B. R. Dorokhova, and V. M. Mikhaylov *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 24-29 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 20-24 (For primary document see N79-14716 05-51)
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N79-14723# Joint Publications Research Service, Arlington, Va.

STABILITY OF CIRCADIAN SYSTEM OF THE BODY

S. I. Stepanova *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 35-42 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 28-34 (For primary document see N79-14716 05-51)
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N79-14724# Joint Publications Research Service, Arlington, Va.

DYNAMICS OF IMPAIRMENT OF PILOT PERFORMANCE IN THE PRESENCE OF HYPOXIA

V. V. Lapa and G. M. Chernyakov *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 43-48 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 34-38 (For primary document see N79-14716 05-51)
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N79-14725# Joint Publications Research Service, Arlington, Va.

COMBINED EFFECT OF HYPEROXIA, LOW PRESSURE AND EXERCISE ON THE RATE OF METHYLKETONE EXCRETION FROM THE HUMAN BODY

A. V. Sedov, G. A. Gaziyev, N. A. Surovtsev, G. Ye. Mazneva, O. N. Shevkun, A. N. Ivanov, L. I. Kobzeva, G. A. Ryakhovskaya, and L. A. Popova *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 49-53 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 39-42 (For primary document see N79-14716 05-51)
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N79-14729# Joint Publications Research Service, Arlington, Va.
STATE OF BLOOD CLOTTING DURING PROLONGED HYPOKINESIA
L. P. Sviridkina *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 77-81 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 59-63 (For primary document see N79-14716 05-51)
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N79-14732# Joint Publications Research Service, Arlington, Va.
EFFECT OF INTERMITTENT HYPOXIA ON FUNCTIONAL ACTIVITY OF PERIPHERAL BLOOD NEUTROPHILS
N. A. Luchinina *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 97-101 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 73-76 (For primary document see N79-14716 05-51)
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N79-14733# Joint Publications Research Service, Arlington, Va.
EFFECT OF CEREBROCRANIAL TRAUMA ON REACTIVE DISTINCTIONS OF HYPOTHALAMIC AND HIPPOCAMPAL VESSELS IN THE PRESENCE OF HYPOXIA
Yu. N. Orestenko and N. M. Kovalev *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 102-107 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 76-79 (For primary document see N79-14716 05-51)
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N79-14737# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF THE ACTIVITY OF SOME ENZYMATIC SYSTEMS IN RESPONSE TO A SUPER-HIGH FREQUENCY ELECTROMAGNETIC FIELD
Yu. D. Dumanskiy, L. A. Tomashevaskaya, and A. N. Marzeyev *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 1-7 refs Transl. into ENGLISH from Gigiena i Sanit. (Moscow), No. 8, 1978 p 23-27 (For primary document see N79-14736 05-51)
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N79-14738# Joint Publications Research Service, Arlington, Va.
EFFECTS OF INTERMITTENT MAGNETIC FIELD ON ACTIVITY OF CARBOHYDRATE METABOLISM ENZYMES AND OXYGEN UPTAKE IN TESTICULAR TISSUE
N. A. Udintsev and S. M. Khlynin *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 8-13 refs Transl. into ENGLISH from Ukr. Biokhim. Zh. (Kiev), no. 6, 1978 p 714-717 (For primary document see N79-14736 05-51)
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N79-14739# Joint Publications Research Service, Arlington, Va.
EFFECTS OF MICROWAVES ON CATECHOLAMINE METABOLISM IN THE BRAIN
A. N. Grin *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 14-16 refs Transl. into ENGLISH from Vrachebnoe Delo (Kiev), no. 10, 1978 p 129-130 (For primary document see N79-14736 05-51)
Copyright. Avail: NTIS HC A04/MF A01

N79-14741# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF THE FUNCTIONAL ACTIVITY OF LIVER MITOCHONDRIA ON MICROWAVE RADIATION
Yu. D. Dumanskiy and V. F. Rudichenko *In its* Transl. on USSR Sci, and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 27-32 refs Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), No. 4, 1976 p 16-19 (For primary document see N79-14736 05-51)
Copyright. Avail: NTIS HC A04/MF A01

N79-14742# Joint Publications Research Service, Arlington, Va.
STATE OF PROCESS OF OXIDATION PHOSPHORYLATION OF LIVER MITOCHONDRIA ON EXPOSURE TO AN ELECTRIC FIELD
I. P. Kozyarin and V. F. Rudichenko *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 33-57 refs Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 11, 1978 p 26-29 (For primary document see N79-14736 05-51)
Copyright. Avail: NTIS HC A04/MF A01

N79-14743# Joint Publications Research Service, Arlington, Va.
MECHANISM OF EFFECTS OF MICROWAVES ON ERYTHROCYTE PERMEABILITY FOR POTASSIUM AND SODIUM IONS
E. Sh. Ismailov *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 38-41 refs Transl. into ENGLISH from Biol. Nauki (USSR), no. 3, 1971 p 58-60 (For primary document see N79-14736 05-51)
Avail: NTIS HC A04/MF A01

N79-14744# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF A GENERALIZED OUTPUT INDEX OF A BIOLOGICAL EXPERIMENT AFTER MULTIPLE TESTS
I. P. Los and A. M. Serdyuk *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 53 (JPRS-72606) 12 Jan. 1979 p 42-48 refs Transl. into ENGLISH from Vrachebnoe Delo (Kiev), no. 6, 1975 p 113-117 (For primary document see N79-14736 05-51)
Copyright. Avail: NTIS HC A04/MF A01

N79-14748# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL OUTCOMES OF PROSTHETIC CARDIAC VALVE REPLACEMENT
N. M. Amosov, Ya. A. Bendet, N. M. Verich, M. Yu. Atamanyuk, G. V. Knyshov, N. G. Cherkashina, and V. M. Khandoga *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 51 (JPRS-72588) 10 Jan. 1979 p 1-10 refs Transl. into ENGLISH from Grud. Khir. (Moscow), no. 5, 1978 p 3-8 (For primary document see N79-14745 05-51)
Copyright. Avail: NTIS HC A05/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N79-14768# Royal Aircraft Establishment, Farnborough (England).
PSYCHOLOGICAL ASPECTS OF THE HUMAN-OPERATOR'S ACTIVITY WHILE TRACKING
M. A. Kremen Jul. 1978 15 p refs Transl. into ENGLISH from Vopr. Psikhologii (USSR), v. 6, 1977 p 70-77 (RAE-Lib-Trans-1979; BR65481) Avail: NTIS HC A02/MF A01

The importance of studying the problem of tracking is proven. A conclusion is substantiated about the regulatory role of the dynamic image of processes (objects) when forming control movements in tracking operations. Some concepts are introduced which reflect specific characteristics of the dynamic image. A general substantiation and formulation is given of the concept of formation and decay of the dynamic image. Some essentia'

characteristics of the formulation and decay of the dynamic image are revealed in case of multi dimensional tracking. G.Y.

N79-14769*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A SIMULATOR STUDY OF THE INTERACTION OF PILOT WORKLOAD WITH ERRORS, VIGILANCE, AND DECISIONS

H. P. Ruffell Smith Jan. 1979 58 p refs
(NASA-TM-78472; A-7354) Avail: NTIS HC A04/MF A01 CSCL 05H

A full mission simulation of a civil air transport scenario that had two levels of workload was used to observe the actions of the crews and the basic aircraft parameters and to record heart rates. The results showed that the number of errors was very variable among crews but the mean increased in the higher workload case. The increase in errors was not related to rise in heart rate but was associated with vigilance times as well as the days since the last flight. The recorded data also made it possible to investigate decision time and decision order. These also varied among crews and seemed related to the ability of captains to manage the resources available to them on the flight deck. G.G.

N79-14770# Air Force Human Resources Lab., Brooks AFB, Tex.

SUBJECTIVE MOTION DISCRIMINATION IN THE SIMULATOR FOR AIR-TO-AIR COMBAT Final Report, Sep. 1976 - Jan. 1978

Philip A. Irish, III and James E. Brown Aug. 1978 33 p refs
(AD-A059742; AFHRL-TR-78-26) Avail: NTIS HC A03/MF A01 CSCL 14/2

The primary objective of this study was to acquire subjective information on the ability of pilots to perceptually differentiate between selected conditions of motion cueing in the Simulator for Air-to-Air Combat (SAAC). A second objective was to prepare the initial framework for follow-on studies designed to determine the contributions of motion cueing to pilot performance and training in the SAAC. Four high experience F-4 pilots and four low experience F-4 pilots flew six contact maneuvers in the SAAC under eight experimental conditions of platform motion, G-seat, and G-suit. Subjective ratings were collected from the pilots on the effectiveness of the motion-cueing systems after the completion of each maneuver. The results indicated that the pilots could discriminate changes in G-suit performance via the ratings. However, no differences in the pilot ratings were elicited by changes in the G-seat or platform motion system operation. Author (GRA)

N79-14771# Minnesota Univ., Minneapolis. Dept. of Psychology.

PROCEEDINGS OF THE 1977 COMPUTERIZED ADAPTIVE TESTING CONFERENCE

David J. Weiss, ed. Jul. 1978 457 p refs Conf. held at the Univ. of Minn., Minneapolis 19-22 Jul. 1977
(Contracts N00014-76-C-0243; NR Proj. 150-382; RR0420401)
(AD-A060049) Avail: NTIS HC A20/MF A01 CSCL 05/8

This report is the Proceedings of the 1977 Computerized Adaptive Testing Conference held July 19-22, 1977, at the University of Minnesota. These Proceedings include 27 papers (26 of which were presented at the Conference); discussions of these papers by Darrell Bock, Frederic Lord, Nancy Cole, Ernst Rothkopf, Richard Ferguson, and David Weiss; and a panel discussion entitled 'Future Directions for Computerized Adaptive Testing,' with presentations by Frederic Lord, Mark Reckase, Fumiko Samejima, Vern Urry, and David Weiss. The papers are organized into the following topical sessions: (1) Improving Ability Measurement Using Different Item Formats; (2) Alternative Models for Adaptive Testing; (3) Psychological and Subgroup Effects; (4) Performance Testing by Interactive Simulation; (5) Implementations of Adaptive Testing; (6) Achievement/Performance Testing Viewed as a Classification Problem; (7) Achievement Testing Viewed as a Trait Measurement Problem; and (8) Computer-Based Testing as an Alternative to Paper-and-Pencil Testing. Author (GRA)

N79-14772# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

A MODEL FOR THE PILOT'S USE OF ROLL-AXIS MOTION CUES IN STEADY-STATE TRACKING TASKS Final Report, 15 Jan. 1975 - May 1978

William H. Levison May 1978 87 p refs
(Contract F44620-75-C-0060)
(AD-A059504; BBN-3808; AFOSR-78-1233TR) Avail: NTIS HC A05/MF A01 CSCL 01/3

An experimental and analytical study was undertaken jointly by the Aerospace Medical Research Laboratory and Bolt Beranek and Newman Inc. to test a model for the pilot's use of roll-axis motion cues. Principal experimental variables were the presence or absence of simulator motion, the nature of the external disturbance, simulated vehicle dynamics, and the nature of the motion cues provided during moving-base simulation. The effects of motion cues on closed-loop system performance and pilot response behavior were qualitatively and quantitatively dependent on the details of the tracking task. The optimal-control model for pilot/vehicle analysis provided a relatively task-independent framework for accounting for the pilot's use of motion cues. The availability of motion cues was modeled by augmenting the set of assumed perceptual variables to include the position, velocity, acceleration, and acceleration rate of the roll-axis simulator with the exception that position information was omitted when the roll tilt cue was absent. Results were consistent with the hypothesis of attention-sharing between visual and motion variables. Author (GRA)

N79-14735# Joint Publications Research Service, Arlington, Va.

EFFECT OF PSYCHOPHYSIOLOGICAL SELF-REGULATION ON EMOTIONAL STABILITY OF AVIATION CADETS IN FLIGHT AND ON EFFECTIVENESS OF ASSIMILATION OF FLIGHT TRAINING PROGRAM

V. S. Lozinskiy *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 111-114 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), V. 12, no. 6, 1978 p 80-82 (For primary document see N79-14716 05-51)
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N79-14747# Joint Publications Research Service, Arlington, Va.

VISUAL INFORMATION PROCESSING

T. P. Zinchenko *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 51 (JPRS-72588) 10 Jan. 1979 p 11-20 refs Transl. into ENGLISH from Tekh. Estetika (Moscow), no. 10, 1978 p 9-12 (For primary document see N79-14745 05-51)
Copyright. Avail: NTIS HC A05/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N79-14773# Royal Aircraft Establishment, Farnborough (England).

EVALUATION OF THE AMOUNT OF EXPOSURE TO VIBRATIONS TRANSMITTED TO THE WHOLE BODY CASE OF VIBRATIONS DUE TO A LOADER MOUNTED ON CATAPILLAR TRACKS, A FORK-LIFT TRUCK AND A HYDRAULIC EXCAVATOR

Boulanger, Mistrot, Poirot, and Roure Mar. 1978 77 p refs Transl. into ENGLISH of "Evaluation due degre d'exposition a des vibrations transmises a l'ensemble du corps. Cas des vibrations engendrees par une chargeuse montee sur chenilles, un chariot elevateur et un excavateur hydraulique", Rept-245/RE Inst. Nat. de Rech. et de Securite, Oct. 1976
(RAE-Lib-Trans-1930; BR65531) Avail: NTIS HC A05/MF A01

The amount of vibration to which three types of vehicles subjected their drivers during a working day was studied. A comparative analysis was carried out, using either the conditions of Standard E90-400 or the improvements recommended by INRS. Recommendations are made for improving the seats in

the vehicles to try to reduce the drivers' exposure to vibrations to acceptable limits. J.M.S.

N79-14774# Royal Aircraft Establishment, Farnborough (England).

COMPARATIVE EXPERIMENTS ON PERFORMANCE AND FATIGUE EFFECTS ON PILOTS USING TRACKING TESTS AND PHYSIOLOGICAL MEASUREMENT PARAMETERS

H. Strasser, K.-P. Klinger, W. Mueller-Limmroth, and G. Brilling Jul. 1978 8 p Transl. into ENGLISH from paper presented to the 21st Intern. Congr. on Aviation and Space Med., Munich, 17-21 Sep. 1973 p 237-238

(RAE-Lib-Trans-1971; BR65486) Avail: NTIS HC A02/MF A01

Trials on a pursuit tracking test with simple position control and four reference inputs were carried out initially on ten male industrial employees aged between 40 and 65. Physiological parameters were also measured during testing, namely heart beat frequency, a measure of irregular heart beat, and evoked potentials. Performance was evaluated in terms of the number of errors per unit time. Expected learning curves were produced, but during the adaptive tests the rate of learning increased with time. Runs of the same tests with the same physiological parameters being measured were then performed by a group of nine navy pilots aged 25 to 36, run I without alcohol, run II with 0.6 deg/infinity alcohol. They showed quicker adaptation and faster reactions than the older industrial subjects. The pulse rates of the pilots were higher than those of the group of older subjects. Both groups showed a drop in the evoked potentials during testing caused by tiredness. A lowering of vigilance level caused by small quantities of alcohol could be detected. J.M.S.

N79-14775# Civil Aeromedical Inst., Oklahoma City, Okla.

VISUAL PERFORMANCE ASSESSMENT THROUGH CLEAR AND SUNSCREEN-TREATED WINDOWS

Kenneth W. Welsh, Paul G. Rasmussen, and John A. Vaughan Aug. 1978 16 p refs

(AD-A059750; FAA-AM-78-28) Avail: NTIS HC A02/MF A01 CSCL 01/3

Five combinations of external and internal brightness levels were used. Light transmission values through the clear, gold, silver, and bronze panels were 92, 20, 18, and 8 percent, respectively. Visual performance tests were conducted at 6 m (20 ft) on 12 subjects with normal visual acuity and color vision. Two tasks were conducted under brightness levels on the external display and in the subject's booth, respectively, of 1:1, 5:1, 50:1, 5:5, and 50:5 fL. Visual acuity using Landolt C figures and scores on a contour identification task were minimally impaired for any luminance ratio when the clear (control) panel was used. With the sunscreen panels, scores on both tests decreased as a function of target brightness and panel density. With one external/internal luminance ratio (5:1), identification of signal light colors was generally impaired while viewing through sunscreen materials. Decreases were particularly evident for green and red lights presented at intermediate and low intensity levels. Author

N79-14776# Oregon State Univ., Corvallis. Dept. of Industrial and General Engineering.

THE DEVELOPMENT AND EVALUATION OF OBJECTIVE FREQUENCY DOMAIN BASED PILOT PERFORMANCE MEASURES IN ASUPT Final Report, Mar. 1977 - Feb. 1978

Edward D. McDowell 30 Apr. 1978 41 p refs

(Grant AF-AFOSR-3294-77; AF Proj. 2313)

(AD-A059477; AFOSR-78-1239TR) Avail: NTIS HC A03/MF A01 CSCL 05/9

To realize its full research potential a need exists for the development of an automated objective pilot performance evaluation system for use in the Advanced Simulator for Undergraduate Pilot Training (ASUPT) facility. The present report documents the approach taken for the development of frequency domain pilot control movement based measures and presents data collected from an evaluation study. The results indicate that frequency domain based measures of a pilot's control movements do discriminate between pilot experience levels. These finds are encouraging and demonstrate the potential of this approach for developing an automated objective pilot performance measurement system. Author (GRA)

N79-14777# Drexel Univ., Philadelphia, Pa.

MECHANISMS OF ACTIVATED CARBON DEGRADATION BY PERSPIRATION Final Report, Jul. 1975 - Jun. 1976

Louis L. Pytlewski Jul. 1977 19 p refs

(Contract DAAA15-75-C-0195; DA Proj. 1L7-62710-A-095) (AD-A059872; AD-E410057; DU-SW-4; ARCSL-CR-77035) Avail: NTIS HC A02/MF A01 CSCL 15/2

These investigations covered two distinct subjects: activated charcoal degradation by perspiration and decomposition of chloramine B. Both untreated and treated activated charcoal samples were exposed to synthetic sweat solutions or aqueous solutions of individual components of synthetic sweat. Change in activated charcoal capacity was measured using carbon tetrachloride pick-up measured under static conditions. Gas chromatography was also used for dynamic measurements to determine if individual components could be ranked as to their poisoning effects. Neither static or dynamic tests uncovered any material which could be positively identified as causing capacity reduction. The studies showed that poisoning effects could be reduced by pretreating the charcoal with a pH 7 buffer or by coating the charcoal with hydrophobic substances. Thermal decomposition of chloramine B was studied in two temperature ranges: low (ambient to 100 C) and high (100 C to 185 C). In the low range, decomposition was determined to be the result of hydrolysis of the chloramine B salt. In the high range, decomposition was violent with the generation of a large amount of heat, characteristic of N-Cl compound decomposition. Author (GRA)

N79-14778# Wisconsin Univ. - Madison.

EFFECTS OF INFORMATION PROCESSING REQUIREMENTS ON REACTION TIME OF THE EYE

Christine L. Nelson, Robert M. London, and Gordon H. Robinson 1 Sep. 1978 7 p refs Presented at the 22d Ann. Meeting of the Human Factors Soc.

(Contracts N00014-75-C-0364; NR Proj. 197-028)

(AD-A060099; TR-78-10) Avail: NTIS HC A02/MF A01 CSCL 05/2

This experiment measured eye reaction time as a function of presence or absence of a central control task, type of command, and knowledge of target direction prior to command. It was found that eye reaction time was greater when a subject was involved in a central tracking task than when he was not; it was greater when the command was symbolic than when it was spatial; and it was longer when the target direction was unknown prior to command. These variables also interacted, so that the effect of unknown target direction was greater with a symbolic command. Results of this experiment also showed that subjects sometimes used an initial compensatory pattern of eye-head movements. There were large inter-subject differences, but use of compensation generally increased with complexity of centrally located information which required processing. It thus appears that reaction time of the eye responds to information processing variables in a manner similar to other motor response systems. Author (GRA)

N79-14779# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

REACH CAPABILITY OF MEN AND WOMEN: A THREE-DIMENSIONAL ANALYSIS

Kenneth W. Kennedy Jul. 1978 110 p refs

(AF Proj. 7184)

(AD-A060312; AMRL-TR-77-50) Avail: NTIS HC A06/MF A01 CSCL 05/5

This report contains descriptions of the outer and inner boundaries of the 5th, 50th, and 95th percentile grasping-reach envelopes of men and of women. The reach envelopes are intended to guide the placement of critical hand operated controls for the seated operating and working body positions. The most important envelope is the 5th percentile, since it describes that past which 95 percent of the using population can reach. Thus, a controller located at the boundary of this envelope can be reached by an equivalent percentage of the male or female adult populations. A critical review of previous investigations of arm reach and a description of the Aerospace Medical Research

Laboratory's Grasping-Reach Measuring Device are presented. The data-gathering procedures and the methods of analyses are included. Applications of the data are also discussed. Data are presented in both graphic and tabular form. Vertical (X-Z) and (Y-Z) planes, and horizontal (X-Y) planes through the various percentile envelopes are presented. GRA

N79-14780# Technology, Inc., San Antonio, Tex. Life Sciences Div.

ENGINEERING TEST AND EVALUATION DURING HIGH G. VOLUME 2: ANTI-G VALVES Final Report, 1 Feb. 1975 - 30 Sep. 1976

Roy W. Thompson, Larry J. Meeker, Gary L. Wilson, Arnold G. Krueger, and Paul E. Love Jun. 1978 85 p ref

(Contract F41609-75-C-0026)

(AD-A059521; SAM-TR-78-11-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 06/11

In this second volume of a three-volume study report, a protocol for testing anti-G valves is described and the test results from 6 specimens are reported. The test items include 2 inservice USAF units, 2 RAF units and 2 prototype experimental units (electronic and fluidic). A suggested standardized performance evaluation protocol for future applications is proposed.

Author (GRA)

N79-14781# National Technical Information Service, Springfield, Va.

HUMAN WORK MEASUREMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Oct. 1978

Carolyn A. Shonyo Nov. 1978 175 p Supersedes NTIS/PS-77/1054; NTIS/PS-76/0945; NTIS/PS-75/797

(NTIS/PS-78/1197/9; NTIS/PS-77/1054; NTIS/PS-76/0945; NTIS/PS-75/797) Avail: NTIS HC $28.00/MF $28.00 CSCL 05I

Reports dealing with measurement techniques of human work at jobs and tasks are summarized. Specific topics included are work analysis and evaluation, workload management, operations analysis, task complexity, and performance measurement. This bibliography contains 168 abstracts. GRA

N79-14709# Joint Publications Research Service, Arlington, Va.

PSYCHOLOGICAL EXPERIMENT ON COMPONENTS OF THE MEANING OF WORK

V. I. Batov and M. V. Yermolayeva *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 47 (JPRS-72134) 27 Oct. 1978 p 1-8 refs Transl. into ENGLISH from Tekh. Estetika (Moscow), No. 8, 1978 p 13-15 (For primary document see N79-14708 05-51)

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N79-14720# Joint Publications Research Service, Arlington, Va.

INVESTIGATION OF COMPOSITION OF TRACE CONTAMINANTS IN THE AIR ENVIRONMENT OF THE SOYUZ-22 SPACECRAFT

V. P. Savina, K. N. Mikos, V. Ye. Ryzhkova, A. I. Gorshunova, Yu. G. Nefedov, V. A. Akesenov, and A. A. Lepskiy *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 20-23 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 18-20 (For primary document see N79-14716 05-51)

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N79-14722# Joint Publications Research Service, Arlington, Va.

CHANGES IN HUMAN RENAL FUNCTION IN PASSIVE HEAD-UP AND HEAD-DOWN POSITIONS

A. K. Merzon and V. S. Zeligman *In its* Space Biol. and Aerospace Med., Vol. 12, No. 6 (JPRS-72487) 21 Dec. 1978 p 30-34 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 12, no. 6, 1978 p 25-28 (For primary document see N79-14716 05-51)

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N79-14748# Joint Publications Research Service, Arlington, Va.

LIBERATION OF CARBON MONOXIDE BY MAN WHEN WORKING IN PROTECTIVE GEAR

A. V. Sedov, G. A. Gaziyev, G. Ye. Mazneva, N. A. Surovtsev, L. I. Kobzeva, and O. N. Shevkun *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 51 (JPRS-72588) 10 Jan. 1979 p 33-36 refs Transl. into ENGLISH from Gig. Sanit. (Moscow), no. 8, 1978 p 107-108 (For primary document see N79-14745 05-51)

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N79-14795# Joint Publications Research Service, Arlington, Va

DEVELOPMENT OF AEROSPACE-AVIATION EQUIPMENT DESCRIBED

Boguslaw J. Witowski *In its* Transl. on Eastern Europe: Sci. Affairs, No. 614 (JPRS-72605) 12 Jan. 1979 p 21-26 Transl. into ENGLISH from Skrzydlata Polska (Warsaw), 12 Nov. 1978 p 11 (For primary document see N79-14792 05-59)

Avail: NTIS HC A03/MF A01

N79-14983# Joint Publications Research Service, Arlington, Va.

INFORMATION-HANDLING CAPACITY OF A HUMAN OPERATOR IN DETECTION OF SIGNALS AGAINST A NOISY BACKGROUND

N. M. Novikova *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 21-24 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 97-99 (For primary document see N79-14983 05-99)

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55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N79-14782*# Cornell Univ., Ithaca, N. Y. Lab. for Planetary Studies.

EXOBIOLOGY AND THE ORIGIN OF LIFE Annual Status Report, 1 Oct. 1977 - 30 Sep. 1978

Carl Sagan 1 Sep. 1978 13 p refs

(Grant NGR-33-010-101)

(NASA-CR-157988) Avail: NTIS HC A02/MF A01 CSCL 06C

Research supported wholly or in part by NASA is summarized. Topics covered include the molecular analysis of ultraviolet-photoproduced organic solids synthesized under simulated Jovian conditions; the molecular analysis of organic solids produced by electrical discharge in reducing atmospheres; the organic chemistry of interstellar grains; the spectra of possible organic solids present as aerosols in planetary atmospheres; far infrared studies of organic polymers of possible astrophysical interest; organic dust synthesized in reducing environments by ultraviolet radiation or electric discharge; the diffusion of galactic civilizations; eavesdropping on galactic civilizations; Lander imaging as a detector of life on Mars; and continuing puzzles about Mars. Bibliographic data is included for four additional publications not supported by NASA grant, but related to the objectives of the program.

A.R.H.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N79-14783# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: PHYSICAL SCIENCE AND TECHNOLOGY, NO. 53

30 Oct. 1978 75 p refs Transl. into ENGLISH from various Russian journals

(JPRS-72141) Copyright. Avail: NTIS HC A04/MF A01

Information concerning some of the following topics was reported: (1) development of measuring information systems; (2) the automated state statistical system; (3) automated system for plan calculations in Uzbek Soviet Union; and (4) MARS NTI retrieval software. For individual titles, see N79-14784 through N79-14791.

N79-14784# Joint Publications Research Service, Arlington, Va.

THE DEVELOPMENT OF MEASURING INFORMATION SYSTEMS c60

M. P. Tsapenko *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 1-8 refs Transl. into ENGLISH from Prib. Sist. Upr. (Moscow), no. 8, Aug. 1978 p 4-6 (For primary document see N79-14783 05-59)

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The concept of measuring information systems (IIS) is dicussed. Simultaneous automatic operation of measurement and computation devices are organized in a special class of information equipment. Required information is obtained directly by measurement and/or monitoring the processing of the information and its preparation in the form of a body of concrete numbers, graphs, and statements. The organization of information processing in IIS was also examined in detail. B.B.

N79-14785# Joint Publications Research Service, Arlington, Va.

THE AUTOMATED STATE STATISTICAL SYSTEM c60

L. M. Volodarskiy *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 9-13 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 26, Jun. 1978 p 5 (For primary document see N79-14783 05-59)

Avail: NTIS HC A04/MF A01

The automated state statistical system (ASGS) is an intersectional multilevel system of collection and processing of statistical accounting information. Mathematical economic methods, automated data banks, teleprocessing, and electronic and other computer equipment are utilized extensively. Incorporation of the ASGS in the Soviet Union is described in details. B.B.

N79-14786# Joint Publications Research Service, Arlington, Va.

AUTOMATED SYSTEM FOR PLAN CALCULATIONS IN UZBEK SSR c60

G. Zakirov *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 14-20 Transl. into ENGLISH from Ekonomika i Zhizn (Tashkent), no. 6, 1978 p 64-67 (For primary document see N79-14783 05-59)

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Operation of the automated system for plan calculations at the Gosplan in Uzbek Soviet Union is discussed. The system handles 518 calculations for all the leading sections of the annual national economic plan including capital investment, material technical/supply, agriculture, and the sectors of industry. B.B.

N79-14787# Joint Publications Research Service, Arlington, Va.

COMPLETE MINIATURIZATION IN INSTRUMENT BUILDING, COMPUTER TECHNOLOGY AND ELECTRONICS c60

Yu. R. Nosov *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 21-26 refs Transl. into ENGLISH from Prib. Sist. Upr. (Moscow), no. 8, 1978 p 59-60 (For primary document see N79-14783 05-59)

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The results of the sixth All-union Contest for the best work on complete miniaturization of electronic devices, conducted by the Central Administration of the Scientific and Technical Society for Electronic Systems are presented. The main trend reflected by the works submitted in the competition (totalling about 60) was the utilization of modern microelectronics in radio electronics, instrument building and communications. Large scale integration (LSI), SHF microelectronic devices and optical electronic devices. Author

N79-14788# Joint Publications Research Service, Arlington, Va.

UKRANIAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION SYSTEM c60

V. P. Tron, D. D. Bakolas, and Ye. I. Gershgorin *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 33-38 refs Transl. into ENGLISH from Mekh. Automatiz. Upr. (Kiev), no. 3, Jul.-Sep. 1978 p 39-43 (For primary document see N79-14783 05-59)

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The development of the algorithmic structure and the language apparatus of the MARS NIT (Intersectional Automated Republican System of Scientific and Technical Information) was studied. Its structure made up of compatible modules which meet type and standardization requirements is described in terms of some of the following: (1) document input; (2) structural logical control of documents; (3) document indexing; (4) storage of documents and their retrieval forms; and (5) search in the IRI mode. In addition, the language apparatus and the complexity of the algorithm planned for use in three of the subsystems are oriented towards the Minsk-32 computer and its associated equipment. B.B.

N79-14789# Joint Publications Research Service, Arlington, Va.

MARS NTI RETRIEVAL SOFTWARE DESCRIBED c61

G. A. Solovyeva *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 39-40 Transl. into ENGLISH from Mekh. Automatiz. Upr. (Kiev), no. 3, Jul.-Sep. 1978 p 57-58 (For primary document see N79-14783 05-59)

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The selective information distribution subsystem (IRI) is one of the main subsystems in the Intersectorial Automated Republican Scientific and Technical Information System (MARS NIT). The software of the subsystem is a package of standard programs which carry out, using the dispatcher of the Minsk-32 computer, the function of automated selective information distribution. All the programs in the package are composed in a symbolic coding language as library packages in accordance with the requirements adopted for the software system of the Minsk-32 computer. The program package of the IRL subsystem includes: (1) standard programs from the Minsk-32 software; (2) program for input; (3) control, (4) a program for performance of search procedures; and (5) programs for documentation of files at all stages of processing of the information. Author

N79-14790# Joint Publications Research Service, Arlington, Va.

SYNTHESIS OF MULTICHANNEL RADARS FOR MEASURING THE COORDINATES OF OBJECTS c32

A. P. Lukoshkin and S. S. Poddubnyy *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1979 p 41-52 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved, Radioelektron. (Kiev), v. 21, no. 4, Apr. 1978 p 5-13 (For primary document see N79-14783 05-59)

Copyright. Avail: NTIS HC A04/MF A01

A multichannel radar receiver circuit for angle, range and rate aided tracking of objects in the presence of external interference and noise generated within the receiver was synthesized using methods of nonlinear filtering of Markov processes. A block diagram of synthesized radar indicator was shown and analyzed with various antenna system radiation patterns. Author

N79-14791# Joint Publications Research Service, Arlington, Va.

METHODS OF ENGINEERING REALIZATION OF READ OUT DEVICES FOR PLANE MAGNETIC DOMAINS c31

N. P. Vasilyeva, O. A. Sedykh, and O. M. Fioshkina *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 53-65 refs Transl. into ENGLISH from Prib. Sist. Upr. (Moscow), no. 6, Jul. 1978 p 15-18 (For primary document see N79-14783 05-59)

Copyright. Avail: NTIS HC A04/MF A01

A number of requirements were imposed on the read out devices: the magnitude of the output signal sufficient to control semiconductor integrated amplifiers; the small area occupied by the sensor on the substrate; and the compatibility of the sensor and PMD device manufacturing technologies. The latter requirement assumes especially great importance with industrial output. Based on these requirements, sensors using only two of the

three known methods for read out of FMD, inductive and magnetoresistance (GD) sensors were examined. Author

N79-14792# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 614

12 Jan. 1979 36 p refs Translated into ENGLISH from various East European journals

(JPRS-72605) Avail: NTIS HC A03/MF A01

Technological developments in remote control systems, computer networks, and aerospace engineering are described. For individual titles, see N79-14793 through N79-14795.

N79-14793# Joint Publications Research Service, Arlington, Va.

VIDEOTON REMOTE PROCESS CONTROL SYSTEM DESCRIBED **c60**

Zoltan Kocsis, Endre Sarkozi, and Laszlo Szoke *In its* Transl. on Eastern Europe: Sci. Affairs, No. 614 (JPRS-72605) 12 Jan. 1979 p 1-8 Transl. into ENGLISH from Meres Automat. (Budapest), no. 9, 1978 p 351-354 (For primary document see N79-14792 05-59)

Avail: NTIS HC A03/MF A01

The software system for the remote process terminal is described. The remote process terminal is a real-time system which can be placed at a great distance from the central computer. Advantages include: a reduced burden on the central computer, increased process speed, greater reliability and flexibility, decreased wiring costs, and less expensive one-time software for special needs. The terminal programs consist of terminal instructions to which routines in the internal software correspond. The routines carry out partial tasks such as measurement, credibility check, filtering, and boundary value check. S.B.S.

N79-14794# Joint Publications Research Service, Arlington, Va.

RELIABILITY OF MAGNETIC TAPE AND DISC SUBSYSTEMS OF BULGARIAN RYAD COMPUTER EVALUATED **c60**

Laszlo Bagonyi and Peter Czifra *In its* Transl. on Eastern Europe: Sci. Affairs, No. 614 (JPRS-72605) 12 Jan. 1979 p 1-10 refs Transl. into ENGLISH from Meres Automat. (Budapest), no. 9, 1978 p 339-340 (For primary document see N79-14792 05-59)

Avail: NTIS HC A03/MF A01

The magnetic disc subsystem and the magnetic tape subsystem are described. Two concepts were used to evaluate reliability-incorrect operation and breakdown. The number of monthly breakdowns--taking the data for a one year interval as a base--is presented. A method is given to calculate the average up time per unit. Results show that breakdowns were primarily electro-mechanical or mechanical. S.B.S.

N79-14795# Joint Publications Research Service, Arlington, Va.

DEVELOPMENT OF AEROSPACE-AVIATION EQUIPMENT DESCRIBED **c54**

Boguslaw J. Witowski *In its* Transl. on Eastern Europe: Sci. Affairs, No. 614 (JPRS-72605) 12 Jan. 1979 p 21-26 Transl. into ENGLISH from Skrzydlata Polska (Warsaw), 12 Nov. 1978 p 11 (For primary document see N79-14792 05-59)

Avail: NTIS HC A03/MF A01

A technology assessment of developments in aeronautical equipment is presented. Two devices are described in detail. The first is an electric taste meter which serves to determine the taste threshold of cosmonauts and flight personnel. It expands the scope of scientific research work accomplishments. The second is a cardioleader which serves to monitor the physical training of pilots and cosmonauts. Advances in other areas are also briefly described, such as photographic reconnaissance, equipment storage, protective runway coatings, and aircraft radio equipment. S.B.S.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N79-14796*# Westinghouse Electric Corp., Linthicum Heights, Md.

INVESTIGATION OF CHARGE COUPLED DEVICE CORRELATION TECHNIQUES Progress Report, Dec. 1974 - Sep. 1977

D. R. Lampe, H. C. Lin, and T. J. Shutt Oct. 1978 175 p refs

(Contract NAS1-13674)

(NASA-CR-145334) Avail: NTIS HC A08/MF A01 CSCL 08B

Analog Charge Transfer Devices (CTD's) offer unique advantages to signal processing systems, which often have large development costs, making it desirable to define those devices which can be developed for general system's use. Such devices are best identified and developed early to give system's designers some interchangeable subsystem blocks, not requiring additional individual development for each new signal processing system. The objective of this work is to describe a discrete analog signal processing device with a reasonably broad system use and to implement its design, fabrication, and testing. G.Y.

N79-14797*# National Aeronautics and Space Administration. Pasadena Office, Calif.

HIGH-SPEED MULTIPLEXING OF KEYBOARD DATA INPUTS Patent Application

Tage O. Anderson, inventor (to NASA) (JPL) Filed 29 Dec. 1978 18 p Sponsored by NASA

(Contract NAS7-100)

(NASA-Case-NPO-14554-1; US-Patent-Appl-SN-974473) Avail: NTIS HC A02/MF A01 CSCL 09B

A method and apparatus are provided for a high speed multiplexing system in which keyboard entered data is sequentially and automatically sampled by a multiplexer for input to a computer. A sequencer is provided which sequentially and automatically controls the multiplexer so that each keyboard data input is sampled in accordance with a predetermined sampling. NASA

N79-14798# United Technologies Research Center, East Hartford, Conn.

MICROPROCESSOR REQUIREMENTS FOR IMPLEMENTING MODERN CONTROL LOGIC Technical Progress Report, 1 Feb. - 31 Jul. 1978

Florence A. Farrar and Richard S. Eidens 14 Aug. 1978 20 p

(Contract F49620-78-C-0017; AF Proj. 2304)

(AD-A059506; UTRC/R78-944258-1; AFOSR-78-1305TR; TPR-1) Avail: NTIS HC A02/MF A01 CSCL 09/2

The objective of this Phase I first-year study in a proposed two-phase two-year program is to establish microprocessor requirements for implementing linear quadratic Gaussian (LQG) feedback control logic. These requirements include (1) accuracy, (2) computational capability, including speed and architecture, (3) memory, and (4) interface requirements. The effect on these requirements of various system representations (standard, Jordan canonical, and companion forms) within the LQG control logic is being investigated. The linear system model employed in the study is general in nature. The results will therefore be applicable to a wide range of control problems with which the Air Force and other military services are concerned. Author (GRA)

N79-14799# Sacramento Air Logistics Center, McClellan AFB, Calif.

ENGINEERING AND MANAGEMENT PRINCIPLES OF FIRMWARE

Tom Estelita, Steve Avey, Kurt S. Hansen, Robert L. Kim, Brent Neal, Mike Lofrano, Eugene Long, and Larry Thompson Dec. 1977 33 p refs

(AD-A059487) Avail: NTIS HC A03/MF A01 CSCL 09/2

A computer system consists of three distinguishable parts: hardware, software, and documentation. The question is where does firmware fit into this scheme. In terms of logistic support

the best way to think of firmware is that it is 'software in a can.' The 'can' or medium may be a single integrated circuit or a printed circuit card full of integrated circuits or even an array of printed circuit cards. Whatever the medium, the fact remains that 'canned' software will have hardware characteristics, and its contents will have software characteristics. The dilemma presented by using firmware has an economic basis. The advent of microprocessors has catapulted firmware into being a very economical means for a system manufacturer to house his software. Now, he needs not worry about having a means to load his programs, and what might happen to them if his system loses power. He avoids the cost of some expensive peripherals, complicated primary memory schemes and backup power sources. He can now sell the package with the software completely embedded and invisible to the customer and a potential competitor. He has, however, given up the capability to make easy changes to the system. This is of minor concern in a static, exhaustively tested, system. GRA

N79-14800# Mitre Corp., Bedford, Mass.
MINICOMPUTER ARCHITECTURES FOR EFFECTIVE SECURITY KERNEL IMPLEMENTATIONS
John D. Tangney Oct. 1978 88 p refs
(Contract F19628-78-C-0001; AF Proj. 522N)
(AD-A059449; MTR-3531; ESD-TR-78-170) Avail: NTIS HC A05/MF A01 CSCL 09/21

A security kernel is an isolated, protected, and highly reliable mechanism for providing information access controls within a computer system. Certain hardware features are important for an effective security kernel implementation. In this report the important architectural features are identified, and an evaluation of commercially available minicomputer systems for their support of the important features is presented. The evaluation covers minicomputers offered by the following vendors: MODCOMP, Data General, General Automation, Varian, Prime, Digital Equipment Corporation, Honeywell, IBM, Interdata, and Hewlett-Packard. Author (GRA)

N79-14801# Mitre Corp., Bedford, Mass.
A COMMON FILE APPROACH TO DATA PROCESSING
J. St.Amand Jun. 1978 7 p refs
(Contract F19628-78-C-0001)
(AD-A059359; MP-78-1; ESD-TR-78-300) Avail: NTIS HC A02/MF A01 CSCL 09/2

A network of loosely coupled processors is employed to minimize developmental and operational problems associated with programming a large number of parallel processes. Processors communicate via a central buffer called the Common File. An analysis is made to determine the nature of producer/consumer problems inherent in the architecture. Two classic producer/consumer problems are completely eliminated as a consequence of unique equipment implementation. Remaining producer/consumer problems are on a par with, or less severe than those found in conventional systems. Author (GRA)

N79-14802# Lincoln Lab., Mass. Inst. of Tech., Lexington.
NEW FRONTIERS IN NONLINEAR FILTERING
Richard S. Bucy and Kenneth D. Senne 26 May 1978 61 p refs Prepared in cooperation with Univ. of Southern Calif., Los Angeles
(Contract F19628-78-C-0002; F44620-76-C-0085; Grant AF-AFOSR-3100-76; AF Proj. 649L)
(AD-A059702; TN-1978-16; ESD-TR-78-98) Avail: NTIS HC A04/MF A01 CSCL 09/2

Examples of two and three dimensional phase demodulation problems are presented. Computer realizations for the optimal nonlinear phase estimator are discussed in detail, with emphasis on parallel computer architectures. Implementation of the nonlinear filter on various computer architectures, including the CDC6600/7600, CDC STAR-100, Illiac IV, the CRAY-1, and the Floating Point System AP120B is reviewed. Detailed Monte Carlo performance analysis is presented for the two-dimensional system, while partial results are included for the three-dimensional case. Implications concerning the ideal computer architecture for nonlinear filter realization are discussed. Author (GRA)

N79-14803# Army Military Center, Alexandria, Va.
ARIAN: AN IMPLEMENTATION OF A MICROCOMPUTER OPERATING SYSTEM Final Report
Richard Lee Conn May 1978 191 p refs
(AD-A060210) Avail: NTIS HC A09/MF A01 CSCL 09/2

ARIAN is a microcomputer operating system developed for use with the Z80 microprocessor. A floppy-disk based operating system, ARIAN was designed to be used as a software development system. Its features include a dual file system for memory and disk files, a built-in assembler input line and intra-line editing facilities, and a host of utilities which may be used for system control and program debugging. Although ARIAN was designed specifically for the Z80 microprocessor, the basic concepts learned during its creation and implementation are of general application. These concepts are discussed in the first part of the thesis, while the following sections describe ARIAN in detail and function as a user's manual. Author (GRA)

N79-14804# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
ANALYSIS AND DESIGN OF FAULT-TOLERANT COMPUTER SYSTEMS Interim Report
John P. Hayes 1 Aug. 1978 28 p refs
(Grant AF-AFOSR-3352-77)
(AD-A059936; AFOSR-78-1355TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes the first-year results of an investigation of fault-tolerant computer systems. A new method for measuring recovery time in fault-tolerant multiprocessors was developed. A complete characterization of optimally t-step recoverable systems was obtained, and certain graph transformations that simplify recovery analysis were studied. Some diagnosability properties of n-cube interconnection networks were derived. A study of fault tolerance in large connecting networks was initiated using a new concept of dynamic full access. A design theory based on recursive component expansion capabilities was developed for MSI/LSI systems. The use of similar recursive methods for test pattern generation was also initiated. Promising results were obtained for testing bit-sliced microprocessors and related components. Author (GRA)

N79-14805# Sperry Research Center, Sudbury, Mass.
CONTROLLED INVERSION DEVICES Final Technical Report, 8 Sep. 1975 - 31 Dec. 1977
Harry Kroger Griffiss AFB RADC Jun. 1978 195 p
(Contract F19628-76-C-0105; ARPA Order 2676; AF Proj. 2676)
(AD-A060157; SCRC-CR-78-20; RADC-TR-78-126) Avail: NTIS HC A09/MF A01 CSCL 09/2

Application and theory of Inversion Controlled Switch (ICS) devices (which were previously called 'Controled Inversion Devices') were investigated. Random access memory arrays of discrete devices were constructed in order to test memory array design. Each memory cell had only a single active device. Examination of the current voltage characteristics of the ICS memory cell and experiments on 3 x 3, 1 x 5 and 5 x 1 arrays lead to several refinements of cell design, the most important one being the use of diode isolation of device bases. This final circuit design effectively prevented all unwanted interactions between different memory cells. Using the circuit design a simple 2 x 2 integrated array was designed. The integrated circuit made use of buried layer emitter, junction isolation and amorphous germanium load resistors which were deposited directly on top of device collector contacts. The basic ICS structure chosen for this circuit were molybdenum-SiO2-n-p(-) devices. The circuit fabrication required seven masking steps including the one required to define the buried emitters. Fabrication studies revealed that most difficulties encountered were due to steps which were not connected with the active ICS device itself. Six wafers were processed. The final wafer had 100% yield except for damages incurred in probing. The array worked as expected as a static memory with non-destructive read out. Read, write and erase functions could be accomplished with only small incremental power requirements above that needed for holding information. GRA

N79-14806# Sandia Labs., Albuquerque, N. Mex.
DIGITIZING AND ANALYSIS OF NEUTRON GENERATOR WAVEFORMS
T. C. Bryant Nov. 1977 32 p refs Sponsored by DOE

(SAND-77-1756C; Conf-771206-1) Avail: NTIS HC A03/MF A01

A11 neutron generator waveforms from units tested at the SLA neutron generator test site are digitized and the digitized data stored in the CDC 6600 tape library for display and analysis using the CDC 6600 computer. The digitizing equipment consists mainly of seven Biomation Model 8100 transient recorders, Digital Equipment Corporation PDP 11/20 computer, RK05 disk, Seven-track magnetic tape transport, and appropriate DEC and SLA controllers and interfaces. The PDP 11/20 computer is programmed in BASIC with assembly language drivers. The equipment is used for other functions such as the automated testing of multiple-operation electronic neutron generators. Although other types of analysis were done, the digitized data was used largely for various types of graphical displays using the DCD 6600 and either the SD4020 or DX4460 plotters.

DOE

N79-14807# Southern Research Inst., Birmingham, Ala.
A COMPUTER-BASED CASCADE IMPACTOR DATA REDUCTION SYSTEM Final Report, Feb. 1977 - Jan. 1978
J. W. Johnson, G. I. Clinard, L. G. Felix, and J. D. McCain Mar. 1978 604 p refs
(Contract EPA-68-02-2131)
(PB-285433/9; SORI-EAS-78-422; EPA-600/7-78-042) Avail: NTIS HC A99/MF A01 CSCL 09B

A cascade impactor data reduction system written in the FORTRAN IV language was described. The overall system incorporates six programs: MPPROG, SPLIN1, GRAPH, STATIS, PENTRA, and PENLOG. Impactor design, particulate catch information, and sampling conditions from single impactor runs are used to calculate particle size distributions. MPPROG and SPLIN1 perform data analyses and make curve fits. GRAPH is totally devoted to various forms of graphical presentation of the calculated distributions. STATIS averages data from multiple impactor runs under a common condition. PENTRA or PENLOG calculates the control device penetration and/or efficiency. The plotting routines were written for a PDP15/76 computer. GRA

N79-14284# Joint Publications Research Service, Arlington, Va.
A METHOD OF ERROR CORRECTION IN INTEGRATING DIGITAL MEASUREMENT DEVICES
Ye. D. Baran *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 44-49 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), v. 21, no. 4, Apr. 1978 p 14-19 (For primary document see N79-14257 05-31)
Copyright. Avail: NTIS HC A04/MF A01

N79-14784# Joint Publications Research Service, Arlington, Va.
THE DEVELOPMENT OF MEASURING INFORMATION SYSTEMS
M. P. Tsapenko *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 1-8 refs Transl. into ENGLISH from Prib. Sist. Upr. (Moscow), no. 8, Aug. 1978 p 4-6 (For primary document see N79-14783 05-59)
Copyright. Avail: NTIS HC A04/MF A01

N79-14785# Joint Publications Research Service, Arlington, Va.
THE AUTOMATED STATE STATISTICAL SYSTEM
L. M. Volodarskiy *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 9-13 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 26, Jun. 1978 p 5 (For primary document see N79-14783 05-59)
Avail: NTIS HC A04/MF A01

N79-14786# Joint Publications Research Service, Arlington, Va.
AUTOMATED SYSTEM FOR PLAN CALCULATIONS IN UZBEK SSR
G. Zakirov *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 14-20 Transl. into ENGLISH from Ekonomika i Zhizn (Tashkent), no. 6, 1978 p 64-67 (For primary document see N79-14783 05-59)
Copyright. Avail: NTIS HC A04/MF A01

N79-14787# Joint Publications Research Service, Arlington, Va.
COMPLETE MINIATURIZATION IN INSTRUMENT BUILDING, COMPUTER TECHNOLOGY AND ELECTRONICS
Yu. R. Nosov *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 21-26 refs Transl. into ENGLISH from Prib. Sist. Upr. (Moscow), no. 8, 1978 p 59-60 (For primary document see N79-14783 05-59)
Copyright. Avail: NTIS HC A04/MF A01

N79-14788# Joint Publications Research Service, Arlington, Va.
UKRANIAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION SYSTEM
V. P. Tron, D. D. Bakolas, and Ye. I. Gershgorin *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 33-38 refs Transl. into ENGLISH from Mekh. Automatiz. Upr. (Kiev), no. 3, Jul.-Sep. 1978 p 39-43 (For primary document see N79-14783 05-59)
Copyright. Avail: NTIS HC A04/MF A01

N79-14793# Joint Publications Research Service, Arlington, Va.
VIDEOTON REMOTE PROCESS CONTROL SYSTEM DESCRIBED
Zoltan Kocsis, Endre Sarkozi, and Laszlo Szoke *In its* Transl. on Eastern Europe: Sci. Affairs, No. 614 (JPRS-72760S) 12 Jan. 1979 p 1-8 Transl. into ENGLISH from Meres Automat. (Budapest), no. 9, 1978 p 351-354 (For primary document see N79-14792 05-59)
Avail: NTIS HC A03/MF A01

N79-14794# Joint Publications Research Service, Arlington, Va.
RELIABILITY OF MAGNETIC TAPE AND DISC SUBSYSTEMS OF BULGARIAN RYAD COMPUTER EVALUATED
Laszlo Bagonyi and Peter Czifra *In its* Transl. on Eastern Europe: Sci. Affairs, No. 614 (JPRS-72605) 12 Jan. 1979 p 1-10 refs Transl. into ENGLISH from Meres Automat. (Budapest), no. 9, 1978 p 339-340 (For primary document see N79-14792 05-59)
Avail: NTIS HC A03/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N79-14808*# Intermetrics, Inc., Cambridge, Mass.
PROGRAMMING IN HAL/S
Michael J. Ryer Sep. 1978 326 p
(Contract NAS9-13864)
(NASA-CR-151872) Avail: NTIS HC A15/MF A01 CSCL 09B

HAL/S is a computer programming language; it is a representation for algorithms which can be interpreted by either a person or a computer. HAL/S compilers transform blocks of HAL/S code into machine language which can then be directly executed by a computer. When the machine language is executed, the algorithm specified by the HAL/S code (source) is performed. This document describes how to read and write HAL/S source.

G.Y.

N79-14809# Analytical Systems Engineering Corp., Burlington, Mass.
MATHEMATICAL ANALYSIS AND IMPLEMENTING SOFTWARE FOR PHYSICAL AND ENGINEERING DATA Final Report, 17 May 1977 - 16 May 1978
Edward J. Ziemba, Andre Lacroix, John Crosby, Kathleen Lewis, Peter Chin, John Derboghosian, and Joseph Estermann Jun. 1978 171 p refs
(Contract F19628-77-C-0174)
(AD-A059378; AFGL-TR-78-0166) Avail: NTIS HC A08/MF A01 CSCL 12/1

The purpose of this report is to describe most of the numerical analysis, data analysis and computer programming problems performed under Contract F19628-77-C-0174. The problems vary in complexity from straightforward program adaptation to tasks requiring analysis, determining, implementing, and sometimes deriving algorithms best suited to perform the calculations. The problems discussed are done so in summary form. The analysis and programming techniques required are outlined. It should be noted that some of these problems are still being analyzed because of their complexity or continuing nature.
Author (GRA)

N79-14810# Computer Sciences Corp., El Segundo, Calif.
AUTOMATED CODE GENERATORS FOR COMPILERS Final Technical Report, Sep. 1976 - Mar. 1978
E. Chu, E. Halb, H. McCoy, and R. Morton Aug. 1978 18 p
(Contract F30602-76-C-0429)
(AD-A059699; RADC-TR-78-157) Avail: NTIS HC A02/MF A01 CSCL 09/2

This project was undertaken with the intent of devising a method or tool for automating the production of the code generator portion of compilers. The main objective was to develop a Quick Code Generator (QCG) that would be capable of producing JOVIAL compilers in less than 3 months. This generator would develop loose code for an interim compiler. This effort resulted in developing the Machine Independent Macro Instruction Code (MIMIC) language. This language consisted of 113 macros and a QCG was successfully produced for the HIS 6000 system. However, the effort fell short by not producing macro definition files for other target machines. It should be noted that RADC's JOVIAL Compiler Validation System was executed with the original JOCIT compiler and the QCG JOCIT compiler and the differences in compilation time, execution time and the total code produced were insignificant. Author (GRA)

N79-14811# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Sciences.
THE EVOLUTION OF ABSTRACTION IN PROGRAMMING LANGUAGE Interim Report
Loretta Rose Guarino 22 May 1978 44 p refs Sponsored in part by NSF
(Contract F44620-73-C-0074; ARPA Order 2466)
(AD-A059394; CMU-CS-78-120; AFOSR-78-1251TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

As understanding of the role of abstraction in programming has improved, programming languages have evolved in their use and support of abstraction. This paper defines abstraction and discusses how the use of abstraction in programming languages assists the programmer. It traces in depth the development of support for the abstraction of objects and for the abstraction of control constructs in programming languages. GRA

N79-14812# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
EVALUATION OF THE BITSTRING ALGORITHM Interim Report
Peter H. Feiler 12 Apr. 1978 39 p
(Contract F44620-73-C-0074; ARPA Order 2466; AF Proj. 2466)
(AD-A059390; CMU-CS-78-111; AFOSR-78-1252TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

A resource allocation technique based on an alternative data representation to the list structure, i.e. the bitvector, is discussed in this paper. The data structure provides for implicit collapsing of available resources, and the algorithm, called Bitstring, can be applied to any type of resource without performance loss. An optimized implementation of Bitstring is compared with a corresponding list structure algorithm (Firstfit). Two bitvector algorithms for special resource allocation environments, Exact-string and Quickstring, are presented. The implementation of Bitstring in microcode on a PDP-11/40E and the resulting performance improvement relative to the assembly code implementation are discussed. Author (GRA)

N79-14813# California Univ., Santa Cruz. Dept. of Information Sciences.
A CONCISE EXTENSIBLE METALANGUAGE FOR TRANSLATOR IMPLEMENTATION
Douglas L. Michels 31 Jul. 1978 8 p refs Presented At the USA-Japan Computer Conf., San Francisco, 1978
(Contract N00014-76-C-0682)
(AD-A059388; TR-78-7) Avail: NTIS HC A02/MF A01 CSCL 09/2

A very concise metalanguage is presented. This language is capable of describing context free languages, including itself. Several mutually recursive functions define an interpreter for this language. The metalanguage and interpreter are extended to allow the inclusion of emitters. This makes possible the description of translations. A metatranslator is shown which is capable of self-translation. The addition of labeled productions makes possible a metatranslation language in the style of BNF. Author (GRA)

N79-14814# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
PIVOT AND COMPLEMENT: A HEURISTIC FOR 0-1 PROGRAMMING
Egon Balas and Clarence H. Martin Feb. 1978 43 p refs
(Contract N00014-75-C-0621; Grant NSF MPS-73-08534; NR Proj. 047-048)
(AD-A059873; MSRR-414; WP-34-77-78) Avail: NTIS HC A03/MF A01 CSCL 12/2

The pivot and complement procedure is a heuristic for finding approximate solutions to 0-1 programming problems. It uses the fact that a 0-1 program is equivalent to the associated linear program with the added requirement that all slack variables be basic. The procedure starts by solving the linear program; then performs a sequence of pivots aimed at putting all slacks into the basis at a minimal cost in dual feasibility, while taking care of occasionally arising primal infeasibilities by complementing some nonbasic 0-1 variables; finally, it attempts to improve the 0-1 solution obtained in this way by a local search based again on complementing certain sets of 0-1 variables. GRA

N79-14815# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PLURIBUS DOCUMENT 4: BASIC SOFTWARE
M. F. Kraley Sep. 1978 147 p
(Contract DCA200-77-C-0616)
(AD-A060256; BBN-3001) Avail: NTIS HC A07/MF A01 CSCL 09/2

The Pluribus is a reliable, expandable, high bandwidth line of multi-resource computers originally developed for use as a switching node in the ARPA computer network. It can be configured with arbitrary amounts of memory and I/O tailored to suit the application; it is designed to survive failures and continue operation without human intervention even while repairs are in progress. This report, one of a set of nine volumes documenting the Pluribus line, specifies the instruction set of the processor, introduces the assembly language currently used, and provides a manual for the system debugging program.
Author (GRA)

N79-14816# George Washington Univ., Washington, D. C. Inst. for Management Science and Engineering.
LARGE SCALE NONLINEAR PROGRAMMING
Garth P. McCormick 15 Jun. 1978 19 p refs
(Grant DAAG29-76-G-0150)
(AD-A060148; SERIAL-T-275; ARO-13622.5-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper considers first the real world situations which give rise to large nonlinear programming problems. Next the algebraic structure of these problems is analyzed. A brief survey of algorithms for solving them is given with emphasis on those whose computer programs are available. Concluding remarks concern an estimation of future research required in this area.
Author (GRA)

N79-14817# Naval Postgraduate School, Monterey, Calif.
A DESIGN FOR A FUNCTION-DESCRIPTIVE PROGRAMMING LANGUAGE M.S. Thesis
Jerry Gregory Paccassi, II and Carl Eric Wick Jun. 1978 228 p refs
(AD-A059692; NPS-52-78-003) Avail: NTIS HC A11/MF A01 CSCL 09/2

A design for a function-descriptive programming language is described. The language is based upon a software design model which uses the process of abstraction and successive

refinement in problem solving. The resulting programming language provides mechanisms and structures conducive to language extension, ease of program development and enhancement of software reliability. A system's library expands the capability of the base language to satisfy the needs of a user or user group. The user, therefore, does not need to carry the burden of those features of the language which he does not use. Because of its potentially small size, the translator or compiler of the base language may be feasibly implemented on microcomputer developmental systems. Author (GRA)

N79-14818# Delaware Univ., Newark. Dept. of Statistics and Computer Science.

ALGORITHMIC ANALYSIS OF A MULTIPROGRAMMING MULTIPROCESSOR COMPUTER SYSTEM Interim Report

Guy Latouche Jul. 1978 39 p refs Prepared in cooperation with Brussels Univ., Belgium

(Grant AF-AFOSR-3236-77)

(AD-A059490; TR-78/13; AFOSR-78-1347TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

A computer system consisting of several identical CPU and several identical I/O units is described. The system works under light load conditions in a multiprogramming mode. Programs belong either to an incoming queue, which may be empty, or to an inner loop if they are allowed access to the resources of the system. The maximum number of programs in the inner loop is finite. Under Markovian assumptions, it is shown that the steady-state probability distribution is of matrix-geometric form. The stability condition is explicitly given. For stable systems, it is shown how the stationary probability distribution, the virtual waiting time in the incoming queue and other features of interest may be computed. Author (GRA)

N79-14819# Illinois Univ., Urbana. Dept. of Computer Science.

SOFTWARE SYSTEMS RESEARCH ANNUAL REPORT Annual Report, 16 Jul. 1976 - 15 Jul. 1977

1977 18 p Sponsored by DOE

(COO-2383-41) Avail: NTIS HC A02/MF A01

Progress was made on (1) the oscillating ODE problem (a method that may provide the first practical scheme for integrating a sizeable class of nonlinear oscillating problems), (2) completion of the MAP compiler for the MODEL generalized simulation language, (3) completion of the simulator for the interactive graphical pseudo-computer, and (4) the integration of the Interdata 732 computer into the interactive PDP-11 system. DOE

N79-14820# Battelle Pacific Northwest Labs., Richland, Wash.

MFAULT: A COMPUTER PROGRAM FOR ANALYZING FAULT TREES

P. J. Palto and W. L. Purcell Nov. 1977 58 p refs Sponsored by DOE

(BNWL-2145) Avail: NTIS HC A04/MF A01

A description and user instructions are presented for MFAULT, a FORTRAN computer program for fault tree analysis. The cut sets of a fault tree, calculates their probabilities, and screens the cut sets on the basis of specified cut-offs on probability and/or cut set length are identified by MFAULT. MFAULT is based on an efficient upward-working algorithm for cut set identification. The probability calculations are based on the assumption of small probabilities and constant hazard rates (i.e., exponential failure distributions). Cut sets consisting of repairable components (basic events) only, non-repairable components only, or mixtures of both types can be evaluated. Components can be on-line or standby. Unavailability contributions from pre-existing failures, failures on demand, and testing and maintenance down-time can be handled. DOE

N79-14821# National Geodetic Survey, Rockville, Md.

AN ALGORITHM TO COMPUTE THE EIGENVECTORS OF A SYMMETRIC MATRIX

Erwin Schmid Aug. 1978 10 p refs

(PB-287923/7; NOAA-TR-NOS-75; NGS-10; NOAA-78092201) Avail: NTIS HC A02/MF A01 CSCL 12A

A method is outlined and illustrated by an example to compute iteratively both the eigenvalues and the corresponding matrix of eigenvectors simultaneously. The program is applicable to symmetric matrices with ream eigenvalues and, in particular, to the positive definite matrices of least-squares theory. A high degree of precision, limited only by the capacity of the computers, is attainable with relatively few iterations that approach the result exponentially. GRA

N79-14789# Joint Publications Research Service, Arlington, Va.

MARS NTI RETRIEVAL SOFTWARE DESCRIBED

G. A. Solovyeva *In its* Transl. on USSR Sci. and Technol. (JPRS-72141) 30 Oct. 1978 p 39-40 Transl. into ENGLISH from Mekh. Automatiz. Upr. (Kiev), no. 3, Jul.-Sep. 1978 p 57-58 (For primary document see N79-14783 05-59)

Copyright. Avail: NTIS HC A04/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N79-14822# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

OPTIMAL ROUTING WITHIN LARGE SCALE DISTRIBUTED COMPUTER-COMMUNICATIONS NETWORKS Ph.D. Thesis

William Howard Green May 1978 223 p refs

(AD-A059849; AFIT-CI-78-69) Avail: NTIS HC A10/MF A01 CSCL 09/2

This research investigates algorithms which function relatively independent of storage and bandwidth and are therefore adaptable to any size network. The primary tool for demonstrating efficient algorithms lies with simulation. The importance of mathematical techniques, however, cannot be overlooked. Therefore, the initial phase of the research involves the investigation and development of abstract analytical concepts which provide an impetus to the design of the simulator. The approach employs a heuristic searching mechanism which requires that a network be described as a graph using the root-node-leaf notation. The level of the tree is equivalent to the known delay about a network at any particular node. The algorith searches the tree down each leg, evaluating the path from each leaf to the destination node using heuristic information to determine the optimum path. This approach is combined with the classical decomposition-synthesis network evaluation technique to derive a formula for delay. Several heuristic measures applicable to this formula are evaluated by the simulator. GRA

N79-14823# Arnold Engineering Development Center, Arnold Air Force Station, Tenn.

STATIC FORCE TESTS ON THE AEDC-VKF STANDARD 5 DEG. CONES IN TUNER, BOUNDARY LAYER FLOW, REYNOLDS NUMBER, FLOW FIELDS, DATA BASES, AERODYNAMIC CONFIGURATION, SURFACES

Aug. 1978 42 p

(AD-A059848) Avail: NTIS HC A03/MF A01 CSCL 20/4

Static stability and base pressure tests were conducted, on the AEDC-VKF standard force cone. The tests were performed at nominal Mach numbers of 3.01, 3.25, 3.51, 3.76, 4.02, 4.52, 5.04, 5.58, and 5.95 at free-stream unit Reynolds numbers ranging from 800,000 per foot to 7,000,000 per foot. The angle-of-attack and sideslip angle ranges were -13 to 13 deg. The effects of nose geometry, boundary layer trips, fins, Reynolds number, and model location in the test section were investigated. Model flow-field photographs were obtained on all configurations at selected conditions. Author (GRA)

N79-14824# Mitre Corp., Bedford, Mass.

ISSUES IN COMPUTER NETWORK SECURITY

A. C. Hinckley and J. Mitchell Sep. 1978 69 p refs

(Contract F19628-76-C-0001)

(AD-A060007; MTR-3201; ESD-TR-78-167) Avail: NTIS HC A04/MF A01 CSCL 17/2

A secure network, like a secure single-computer system, must incorporate mechanisms for monitoring access to classified objects. In particular, a secure network must protect interprocess communication between hosts. Implementation of a network-wide reference monitor is difficult because information must be transferred from the protected environment of one secure host

through the communications network (which will usually incorporate communications processors) to the environment of another secure host. The difficulties are increased because the hosts may be operating at different security levels and some may not incorporate multilevel secure capabilities. Network reference monitor requirements can be met, however, if: (1) the reference monitor of each host can obtain the necessary security data to perform access checks for enforcing nondiscretionary and discretionary properties; and (2) the transmission between computers (e.g., hosts and communications processors) and between computers and terminals are secured by a combination of physical and logical protection. Implementation of the network reference monitor may be viewed at different levels-host-to-host, host-to-communications subnet, and communications processor-to-communications processor. In practice, the mechanism may be distributed among these levels and between the different computers originating, transferring and receiving each message. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support*.

N79-14825# Delaware Univ., Newark. Dept. of Statistics and Computer Sciences.

EXPONENTIAL SERVERS SHARING A FINITE STORAGE: COMPARISON OF SPACE ALLOCATION

Guy Latouche May 1978 49 p refs

(Grant AF-AFOSR-3236-77; AF Proj. 2304)

(AD-A059508; TR-78/9; AFOSR-78-1142TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Consider a finite waiting room shared by several servers. Such a system may approximate, for instance, a packet switch in a communications network or a buffer shared by producer-consumer parallel processes. It is assumed that a customer is lost if he cannot enter the waiting room. Furthermore, the waiting room is partitioned into (L-1) areas, where L is the number of servers: each of the first L areas is reserved for the exclusive use of one server, the (L-1)st is common and may be used by all servers. This allocation policy is referred to as (L-1)- sharing. GRA

N79-14826# Delaware Univ., Newark. Dept. of Statistics and Computer Science.

A DUALITY THEOREM FOR PHASE TYPE QUEUES

V. Ramaswami and Marcel F. Neuts Jun. 1978 25 p refs Prepared in cooperation with Purdue Univ.

(Grants AF-AFOSR-3236-77; AF-AFOSR-235--72; AF Proj. 2304)

(AD-A059509; TR-78/11; AFOSR-78-1143TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A duality theorem of Heathcote exhibiting and relationship between first passage times of the queue length in the GI/M/1 queue and the busy period of its dual M/G/1 queue is generalized to the phase type queues GI/PH1 and PH/G/1. The phase type distributions include a number of wellknown models such as generalized Erlang and hyper-exponential as special cases and form a versatile class with a number of interesting closure properties. Author (GRA)

N79-14827# California Univ., Berkeley. Operations Research Center.

APPROXIMATIONS IN FINITE CAPACITY MULTI-SERVER QUEUES WITH POISSON ARRIVALS

Shirley A. Nozaki and Sheldon M. Ross Dec. 1977 19 p refs

(Contract N00014-77-C-0299; Grant DAAG29-76-G-0042)

(AD-A059461; ORC-77-34; ARO-13179.6-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper considers an M/G/K queueing model having finite capacity N. That is, a model in which customers, arriving in accordance with a Poisson process having rate lambda, enter the system if there are less than N others present when they arrive, and are then serviced by one of K servers, each of whom has service distribution G. Upon entering, a customer will either immediately enter service if at least one server is free or else join the queue if all servers are busy. Our results will be independent of the order of service of those waiting in queue as long as it is supposed that a server will never remain idle if customers are waiting. To facilitate the analysis, however, assume a service discipline of first come first to enter service. GRA

N79-14828# Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.

STUDIES IN OPTIMAL CONTROL, ESTIMATION AND LINEAR SYSTEMS THEORY Final Report, 1 Feb. 1973 - 31 Aug. 1977

Cecil L. Smith 1978 16 p refs

(Grant AF-AFOSR-2580-74; AF Proj. 2304)

(AD-A059716; AFOSR-78-0875TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report is the final report covering a four year investigation into identification and control of real-time systems. The major results are summarized, the publications and presentations listed, and the present status of the participating students is included. Author (GRA)

N79-14829# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.

EXTRACTING AND LABELLING BOUNDARY SEGMENTS IN NATURAL SCENES Interim Report

John M. Prager Sep. 1978 46 p Revised and updated from COINS-TR-77-7

(Contract N00014-75-C-0459; Grant NS-09755)

(AD-A060042; COINS-TR-78-17; COINS-TR-77-7) Avail: NTIS HC A03/MF A01 CSCL 09/4

This paper describes a set of algorithms used to perform segmentation of natural scenes through boundary analysis. The techniques include preprocessing, differentiation using a very simple operator, relaxation using case analysis, and postprocessing. The system extracts line segments as connected sets of edges, labels them, and computes features for them such as length and confidence. Author (GRA)

N79-14830# Texas Technological Univ., Lubbock. Inst. for Electronics Science.

ANNUAL REVIEW OF RESEARCH UNDER THE JOINT SERVICES ELECTRONICS PROGRAM Interim Report

R. Saeks, K. S. Chao, R. B. Asher, J. Walkup, and T. Newman 1 Oct. 1978 142 p refs

(Contract N00014-76-C-1136)

(AD-A059977) Avail: NTIS HC A07/MF A01 CSCL 09/5

The report represents the third review of research conducted under the auspices of the joint services electronics program at the Institute for Electronic Science at Texas Tech University. Specific topics covered include fault analysis, stochastic control and estimation, nonlinear control, multidimensional system theory, optical noise, and pattern recognition. GRA

N79-14831# Southeastern Massachusetts Univ., North Dartmouth. Dept. of Electrical Engineering.

FEATURE EXTRACTION AND SIGNAL PROCESSING APPROACH TO REALTIME PATTERN RECOGNITION Final Report

C. H. Chen Aug. 1978 15 p refs

(Grant AF-AFOSR-2951-76)

(AD-A059829; EE-78-5; AFOSR-78-1279TR) Avail: NTIS HC A02/MF A01 CSCL 06/4

The integration of feature extraction for pattern recognition and the digital signal processing into one study as performed in this project has resulted in advances in both areas, and the discovery of many new ideas which are beneficial to both areas. There are common problems, such as the finite sample size effect, in both pattern recognition and signal processing. For example, digital signal processing techniques are much needed in extracting effective features while statistical pattern recognition can be useful in image processing. More specifically, this research has carefully examined the fundamental problem of the finite sample size and its effect on feature selection and classification rules. Most effective features for seismic pattern recognition have been developed through the signal modelling study. In the image recognition work, new results include the rotationally invariant digital Laplacian operation and a new adaptive Kalman filtering

technique for efficient realtime image processing. Detailed computer results have been developed and documented to support the theoretical study. Finally, for image classification, the specific problem of contextual information is examined and a decision tree procedure is developed which can process both the statistical and structural features for effective classification.
Author (GRA)

N79-14829# Joint Publications Research Service, Arlington, Va.
AUTOMATED CONTROL SYSTEM DEVELOPMENT
Robert Sergeyevich Sedegov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 6-13 Transl. into ENGLISH from Prom. Belorussii (Minsk), no. 8, 1978 p 63-68 (For primary document see N79-14257 05-31)
Copyright. Avail: NTIS HC A04/MF A01

N79-14831# Joint Publications Research Service, Arlington, Va.
PROBLEMS ON EFFICIENT INTRODUCTION OF ASU'S CITED
S. Salimov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 20-29 Transl. into ENGLISH from Ekon. i Zhizn (Tashkent), no. 4, 1978 p 51-56 (For primary document see N79-14257 05-31)
Copyright. Avail: NTIS HC A04/MF A01

N79-14984# Joint Publications Research Service, Arlington, Va.
THE 1978 STATE PRIZE AWARDED FOR PATTERN RECOGNITION WORK
S. Ilicheva *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 1-3 Transl. into ENGLISH from Sov. Latviya (Riga), 23 Nov. 1978 4 p (For primary document see N79-14983 05-99)
Copyright. Avail: NTIS HC A05/MF A01

N79-14985# Joint Publications Research Service, Arlington, Va.
EXHIBIT FEATURES LATEST ADVANCES IN AUTOMATED CONTROL SYSTEMS
S. B. Abramov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 4-11 Transl. into ENGLISH from Pribory i Sistemy Upr. (Moscow), no. 11, 1978 p 54-56 (For primary document see N79-14983 05-99)
Copyright. Avail: NTIS HC A05/MF A01

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N79-14832# Pittsburgh Univ., Pa.
THEORY AND APPLICATION OF A DIRECT TEST PROCEDURE FOR POLYNOMIAL ZEROS ON POLYDISC DISTINGUISHED BOUNDARY M.S. Thesis
Sankar Basu 1978 98 p refs
(Grants NSF ENG-76-84161; AF-AFOSR-3542-78)
Avail: NTIS HC A05/MF A01

The problem of finding directly whether or not a multivariable polynomial in z sub 1, z sub2, ...,z sub n has any zeros on the distinguished boundary D: sub n: z sub 1 = z sub 2 = ... = z sub n = 1 of the polydisc was investigated. The feasibility for implementation of the test via rational operations was demonstrated for the two-variable case. Singular cases were given due attention. A scheme that reduces the computational complexity in implementing the test is suggested. For n greater than or equal to 3, the various computational deficiencies that arise in the implementation of the test procedure are pointed out. G.G.

N79-14833# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A METHOD FOR CALCULATING BIDIMENSIONAL FOURIER-BESSEL TRANSFORMATION FUNCTIONS [UM METODO PARA CALCULO DOS COEFICIENTES DA TRANSFORMADA DE FOURIER-BESSEL BIDIMENSIONAL]
Jose Antonio Goncalves Pereira and Luiz Gylvan Meira Filho Dec. 1978 42 p In PORTUGUESE
(INPE-1407-NTE/140) Avail: NTIS HC A03/MF A01

The Gauss quadrature method is extended for the two dimensional case with restriction of the abcissas in order to obtain coefficients for Fourier-Bessel series expansion. A table of zeros for the Bessel functions is included. A.R.H.

N79-14834# Wisconsin Univ. - Madison. Dept. of Statistics.
AUTOMATIC SMOOTHING OF THE LOG PERIODOGRAM
Grace Wahba Aug. 1978 14 p refs
(Contract N00014-77-C-0675)
(AD-A059596; UWIS-DS-536) Avail: NTIS HC A02/MF A01 CSCL 12/1

Consider an estimate of the log spectral density based on smoothing the log periodogram with a smoothing spline. This estimate is also a windowed estimate. An unbiased estimate R(lambda) of the expected integrated mean square error can be obtained as a function of the smoothing, or bandwidth parameter lambda. The smoothing parameter is then chosen as that lambda which minimizes R(lambda). The degree of the smoothing spline (equivalently, the shape parameter of the window) can also be chosen this way. Results of some Monte Carlo experiments illustrating the effectiveness of the method are given. GRA

N79-14835# Emmanuel Coll., Boston, Mass.
EVALUATION OF GENERALIZED GEOMETRIC FACTOR BY USE OF MONTE CARLO METHOD Scientific Report, 1 Oct. 1977 - 31 May 1978
Poh Shien Young, Robert Vesprini, Ernest Holeman, and M. Patricia Hagan Jun. 1978 52 p refs
(Contract F19628-76-C-0039)
(AD-A059305; AFGL-TR-78-0146; SR-3) Avail: NTIS HC A04/MF A01 CSCL 12/1

The Generalized geometric factor G(n, lambda) was evaluated through two approaches of the Monte Carlo Method. The results are tabulated and also graphed as functions of n and lambda where lambda is the angle made by the spin axis and the geomagnetic field. Author (GRA)

N79-14836# Florida Univ., Gainesville. Dept. of Industrial and Systems Engineering.
BINDING INEQUALITIES FOR TREE NETWORK LOCATION PROBLEMS WITH DISTANCE CONSTRAINTS
Richard L. Frances, Barbaros C. Tansel, and Timothy J. Lowe Aug. 1978 32 p refs Sponsored in part by NBS Prepared in cooperation with Purdue Univ., Lafayette, Ind.
(Grants DAHC04-75-G-0150; NSF ENG-76-17810; DA Proj. 2Q0-61102-A-14D)
(AD-A060347; RR-78-10; ARO-12640.31-M) Avail: NTIS HC A03/MF A01 CSCL 12/2

This paper considers the problem of finding locations of several new facilities in an imbedded tree network with respect to existing facilities at known locations so as to satisfy distance constraints, which impose upper bounds on distances between pairs of facilities. It is known that the existence of a feasible solution to the distance constraints is related to shortest paths through an auxiliary network, which has as arc lengths the upper bounds on pairwise facilities distances. This relationship takes the form of necessary and sufficient conditions, termed the separation conditions. Tight separation conditions are related to the solution of multifacility minimax location problems and efficient solutions to multiobjective multifacility location problems. GRA

N79-14837# Naval Ocean Systems Center, San Diego, Calif.
RAPID EQUALIZATION OF HIGHLY DISPERSIVE CHANNELS USING ADAPTIVE LATTICE ALGORITHMS Research Report, Jan. - Mar. 1978
E. H. Satorius and S. T. Alexander 30 Apr. 1978 15 p refs
(XF11101100)
(AD-A059924; NOSC/TR-249) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report presents a study of adaptive lattice algorithms as applied to channel equalization. The orthogonalization properties of the lattice algorithms make them promising for

equalizing channels with heavy amplitude and/or phase distortion. Furthermore, unlike the majority of other orthogonalization algorithms, the number of operations per update for the adaptive lattice equalizers is linear with respect to the number of equalizer taps. Author (GRA)

N79-14838# Aerospace Corp., El Segundo, Calif.
CURVE-OF-GROWTH FUNCTION FOR A RANDOM ARRAY OF VOIGT LINES Interim Report
Stephen J. Young 28 Aug. 1978 8 p refs
(Contract F04701-77-C-0078)
(AD-A058728; TR-0078(3623)-1) Avail: NTIS HC A02/MF A01 CSCL 20/13

The accuracy of two approximations to the curve-of-growth function V(a,x) for a random array of Voigt lines with exponential line strength distribution is examined. An heuristic extension of the Rodgers and Williams approximation for isolated Voigt lines is accurate to better than 9% for all x and a. A modified version of the approximation used in the NASA plume radiation code is accurate to better than 4% for all x and a. GRA

N79-14839# California Univ., Berkeley. Dept. of Industrial Engineering and Operations Research.
GENERALIZED POISSON SHOCK MODELS
Sheldon M. Ross Apr. 1978 10 p refs
(Contract N00014-77-C-0299; Grant AF-AFOSR-3213-77; NR Proj. 042-379)
(AD-A058510; ORC-78-6) Avail: NTIS HC A02/MF A01 CSCL 12/1

Suppose that shocks hit a device in accordance with a nonhomogeneous Poisson process with intensity function Lambda(t). The ith shock causes a damage X sub i. The X sub i(s) are assumed to be independent and identically distributed positive random variables, and are also assumed independent of the counting process of shocks. Let D(x sub1, ..., x sub n) denote the total damage when n shocks having damages x sub 1, ..., x sub n have occurred. It has previously been shown that the first time that D(X) exceeds a critical threshold value is an increasing, failure rate average random variable whenever lambda(t) = lambda and D(X) = sum of x sub i. This result is extended to the case where the integral from 0 to t of lambda(s)ds/t is nondecreasing in t and D(X) is a symmetric, nondecreasing function. The extension is obtained by making use of a recent closure result for increasing failure rate average stochastic processes. Author

N79-14840# Battelle Pacific Northwest Labs., Richland, Wash.
COMP: A BASIC NON-LINEAR LEAST SQUARES CURVE FITTING PACKAGE
C. R. Watson, M. I. Cochran, J. M. Thomas, and L. L. Eberhardt Nov. 1977 6 p refs Presented at DECUS Meeting, San Diego, Calif., 28 Nov. 1977
(Contract EY-76-C-06-1830)
(BNWL-SA-6473; Conf-771144-6) Avail: NTIS HC A02/MF A01

To find a mathematical model which describes (fits) data from a process which is fundamentally nonlinear, one usually uses nonlinear least-squares techniques on maxicomputers. An interactive BASIC procedure was developed which runs on either the PDP-11/34 under RT-11 or the PDP-11/70 under IAS. These programs help the investigator quickly fit the model to the data and statistically evaluate the differences between the two. The parameter estimates thus determined may then be used as guesstimates for the more precise maxicomputer codes. The key to the system is the re-enterant nature of the curve fitting routine (allowed only with a language such as INTERPRETED BASIC). The user supplies estimates of the parameters for the selected model (18 are currently available, and users can easily write their own). The computer tries a few iterative refinements (by using Taylor series expansion of partial derivatives to obtain linearization) of the estimates in an attempt to minimize the deviations between the values predicted by the model and the observed data. ERA

N79-14841# Oak Ridge National Lab., Tenn.
NONEUC: A NUMERICAL PROCEDURE FOR DETERMINING OPTIMUM EUCLIDIAN DISTANCES AND ASSOCIATED COORDINATES DERIVED FROM SIMILARITY COEFFICIENTS
D. E. Fields (Union Carbide Corp., Oak Ridge, Tenn.); C. T. Kelsey, and F. G. Goff Nov. 1977 88 p refs
(Contract W-7405-eng-26)
(EDFB/IBP-75/8; Publ-1110) Avail: NTIS HC A05/MF A01

Numerical optimization techniques are applied to derive, from an input matrix of noneuclidian interspecific distances, a set of species coordinates in a multidimensional space. The euclidian distances corresponding to these derived species coordinates constitute an optimum fit to the input matrix of noneuclidian rational distances, which are derived from similarity coefficients relating the species in question. DOE

N79-14842# National Technical Information Service, Springfield, Va.
INTEGRATION OF NONLINEAR DIFFERENTIAL EQUATIONS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1970 - Nov. 1978
Brian Carrigan Nov. 1978 178 p Supersedes NTIS/PS-77/1058; NTIS/PS-76/0932; NTIS/PS-75/794; NTIS/PS-75/028 (NTIS/PS-78/1194/6; NTIS/PS-77/1058; NTIS/PS-76/0932; NTIS/PS-75/794; NTIS/PS-75/028) Avail: NTIS HC $28.00/MF $28.00 CSCL 12A

Research is cited on the numerical integration of nonlinear differential equations. Other methods of solution included are variational methods, finite difference methods, Laplace transform techniques, Runge-Kutta methods, and conjugate gradient methods, as are solutions to two point boundary value problems and multipoint boundary value problems. This updated bibliography contains 171 abstracts, 67 of which are new entries to the previous edition. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N79-14843# SRI International Corp., Menlo Park, Calif.
MODEL CALCULATIONS OF THE THERMOCHEMICAL PROPERTIES OF GASEOUS METAL HALIDES Interim Report
D. L. Hildenbrand 1977 18 p refs
(Contract F44620-73-C-0037; AF Proj. 2308)
(AD-A059503; AFOSR-78-1164TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two semi-empirical models that have proved useful in estimating the thermochemical properties of gaseous halides are the Rittner electrostatic model and the ionicity-corrected Birge-Sponer extrapolation. These two models, their limitations and their areas of applicability are reviewed so that their potential utility in estimating missing thermochemical data can be assessed realistically. A comparison of results of the gaseous II A metal mono- and dihalides, where thermochemical and molecular constant data are relatively complete, shows that the electrostatic model yields dissociation energies with an accuracy of 10 kcal/mol or better. Application of the electrostatic model to the scandium-group and lanthanide halides is also discussed. There is considerable uncertainty about the nature of the overlap repulsion contribution for the polyatomic halides, but an empirically selected repulsion parameter seems to give satisfactory results. For diatomic molecules, the application of an ionicity correction to the linear Birge-Sponer value generally yields dissociation energies which are accurate to within ten percent or better, but the results are sensitive to the quality of the spectroscopic constants used in the evaluation. When used properly, the two models can be very helpful in providing reliable estimates of thermochemical properties. Author (GRA)

N79-14844# California Univ., Berkeley. Operations Research Center.
LINEAR DECISION MODELS UNDER RISK
Terry R. Harms Apr. 1978 131 p refs
(Contract N00014-76-C-0134)
(AD-A059859; ORC-78-7) Avail: NTIS HC A07/MF A01 CSCL 12/1

The assumption made in linear programming that the

components are Deterministic (constant) numbers is rarely fulfilled in practical applications. This has led to the development of the field of stochastic programming where the random aspect of the coefficients in the objective function, technology matrix, and the vector of resources are taken into account. This research investigates the problem of a linear program with uncertainty attached to the decision vector. For example, a decision to order a certain amount of a perishable good might yield variable amounts of this good at delivery due to spoilage. GRA

N79-14845# Southern Methodist Univ., Dallas, Tex. Dept. of Operations Research and Engineering Management.

GENERATION OF VARIATES FROM DISTRIBUTION TAILS

Bruce W. Schmeiser Jul. 1978 12 p refs
(Contract N00014-77-C-0425; NR Proj. 277-236)
(AD-A060348; OREM-78008) Avail: NTIS HC A02/MF A01 CSCL 12/1

The general acceptance/rejection algorithm for generating random values on a computer is specialized for distribution tails, using an exponential majorizing function and a linear minorizing function. Specific algorithms are given for the normal, gamma, Weibull and beta distributions. While the algorithms can be used alone, it is anticipated that their major value will be to serve as components of algorithms for complete distributions. Author (GRA)

N79-14846# California Univ., Berkeley. Operations Research Center.

ADAPTIVE FORECASTING WITH AN AR(1) MODEL

Robert M. Oliver Oct. 1977 20 p refs
(Contract N00014-76-C-0134)
(AD-A060337; ORC-77-26) Avail: NTIS HC A02/MF A01 CSCL 12/1

Updating formulas for the forecasts of a one-parameter autoregressive model are obtained when the parameter is assumed random. It is shown that the updated forecasts are similar to those derived from exponentially weighted moving average forecasts with the important difference that forecasts can lie outside the interval containing the old forecast and the new observation. Based on the growth of the new observations the updated confidence intervals may become larger or smaller than the old ones. Similarities to and differences between a Box-Jenkins model, a Kalman Filter and a model proposed by Makridakis and Wheelwright are illustrated. Author (GRA)

N79-14847# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.

FURTHER THEORY OF STABLE DECISIONS

David T. Chuang Aug. 1978 104 p refs
(Contract N00014-75-C-0516)
(AD-A060026; TR-151; Rept-12-ONR) Avail: NTIS HC A06/MF A01 CSCL 12/1

In a decision problem, a Bayesian has a loss function, a likelihood function, and a prior opinion. A Bayesian makes a decision by minimizing expected loss. Assuming the likelihood function is fixed and agreed upon, this thesis examines the influence of small variations in loss function and prior opinion. There are a lot of ways to define small variations in loss function and prior distribution. Essentially one has to define distance between two distributions and distance between two loss functions. GRA

N79-14848# North Carolina Univ. at Chapel Hill. Dept. of Biostatistics.

NONPARAMETRIC REPEATED SIGNIFICANCE TESTS FOR SOME ANALYSIS OF COVARIANCE MODELS Interim Report

Pranab Kumar Sen 1978 24 p refs
(Grant AF-AFOSR-2736-74; AF Proj. 2304)
(AD-A059505; AFOSR-78-1286TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

For a general class of nonparametric analysis of covariance problems (with stochastic covariates), some repeated significance testing procedures are developed. These procedures rest on the construction of suitable rank order statistics based on the partial sequence of sample sizes and allow for a monitoring of experimentation with the objective of a possible early termination of experimentation. The basic theory is based on the weak convergence of certain stochastic processes relating to the rank order statistics. Various properties of the proposed tests are discussed. Author (GRA)

N79-14849# North Carolina Univ. at Chapel Hill. Dept. of Biostatistics.

ON FUNCTIONAL CENTRAL LIMIT THEOREMS FOR CERTAIN CONTINUOUS TIME PARAMETER STOCHASTIC PROCESSES Interim Report

P. K. Sen and Y. Tsong 1978 19 p refs
(Grant AF-AFOSR-2736-74)
(AD-A059382; AFOSR-78-1288TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Weak invariance principles for certain continuous time parameter stochastic processes are considered. In particular, the case of continuous time parameter martingale and reverse martingale sequences are treated elaborately and the weak convergence in sup-norm metric is also studied. Some illustrative examples are presented at the end. Author (GRA)

N79-14850# Rochester Univ., N. Y. Dept. of Statistics.

A TEST OF EXPONENTIALITY BASED ON THE BIVARIATE F DISTRIBUTION Interim Report

Chin-Chuong Lin and Govind S. Mudholkar 1978 9 p refs Sponsored in part by Maryland Univ. Baltimore County Faculty Summer Research Fellowship
(Contract AF-AFOSR-3360-77)
(AD-A059383; AFOSR-78-1299TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The tests based upon normalized sample spacings and analogous to the classical homogeneity of variances procedures are the simplest tests of exponentiality. Among these, Ganedenko's Q test is found to be superior against the monotone hazard rate alternative Weibull. In this note the normalized spacings are used in the same spirit but in conjunction with the bivariate F distribution to obtain a test of exponentiality which provides protection against a broad class of alternatives. Author (GRA)

N79-14851# North Carolina Univ. at Chapel Hill. Inst. of Statistics.

ON THE RECONSTRUCTION OF THE COVARIANCE OF STATIONARY GAUSSIAN PROCESSES OBSERVED THROUGH ZERO MEMORY NONLINEARITIES, PART 2

Stamatis Cambanis and Elias Masry (Calif. Univ., San Diego) May 1978 21 p refs
(Contract N00014-75-C-0652; Grant AF-AFOSR-2796-75)
(AD-A059395; MIMEO-SER-1176-Pt-2; AFOSR-78-1254TR)
Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of reconstructing the variance R(0) of a zero mean stationary Gaussian process observed through a zero memory nonlinearity f(x), from the knowledge of f and the first two moments of the output process was considered. The reconstruction is shown to be feasible for certain interval windows, convex nonlinearities and discontinuous unimodal nonlinearities. The paper is the completion of the investigation begun in Cambanis and Masry (1978) where the reconstruction of the normalized covariance R(t)/R(0) was considered. Author (GRA)

N79-14852# North Carolina Univ. at Chapel Hill. Dept. of Biostatistics.

AN INVARIANCE PRINCIPLE FOR PROGRESSIVELY TRUNCATED LIKELIHOOD RATIO STATISTICS Interim Report

P. K. Sen and Y. Tsong 1978 18 p refs
(Grant AF-AFOSR-2736-78; AF Proj. 2304)
(AD-A059404; AFOSR-78-1296TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the context of time-sequential tests based on likelihood ratio statistics, weak convergence (in the Skorokhod as well as the sup-norm metric) of progressively truncated likelihood ratio statistics (to appropriate Wiener processes) is established through the construction of a continuous time-parameter martingale process. The case of local (contiguous) alternatives is also treated. The results are extended to the multiparameter case as well. Author (GRA)

N79-14853# Syracuse Univ., N. Y. Dept. of Industrial Engineering and Operations Research.
HIGH LEVEL EXCEEDANCES OF REGENERATIVE AND SEMI-STATIONARY PROCESSES Interim Report
Richard F. Serfozo Aug. 1978 17 p refs
(Grants AF-AFOSR-2627-74; NSF ENG-75-13653)
(AD-A059339; AFOSR-78-1344TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The asymptotic behavior of high level exceedances of regenerative and semi-stationary processes is studied. Conditions are given under which these exceedance processes converge in distribution to Poisson processes and to processes with nonnegative stationary independent increments. Thinnings of point processes over time with semi-stationary dependencies are also discussed. Author (GRA)

N79-14854# Naval Postgraduate School, Monterey, Calif.
SIMULATION OF NONHOMOGENEOUS POISSON PROCESSES BY THINNING
Peter A. W. Lewis and Gerald S. Shedler Jun. 1978 44 p refs
(RR014050123)
(AD-A059904; NPS-55-78-14) Avail: NTIS HC A03/MF A01 CSCL 12/1

A simple and relatively efficient method for simulating one-dimensional and two-dimensional nonhomogeneous Poisson processes is presented. The method is applicable for any rate function and is based on controlled deletion of points in a Poisson process whose rate function dominates the given rate function. In its simplest implementation, the method obviates the need for numerical integration of the rate function, for ordering of points, and for generation of Poisson variates. Author (GRA)

N79-14855# Missouri Univ. - Columbia. Dept. of Statistics.
IDENTIFICATION PROBLEMS IN THE EXPONENTIAL FAMILY Interim Technical Report
Robert Patrick Kelly Aug. 1978 69 p refs
(Contract N00014-75-C-0443)
(AD-A059908; Rept-78-2) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report considers identification problems for members of the exponential family, applying the results to the density of the logistic model for life table data. For this model when are the maximum likelihood estimates for the model parameters unique; and what type of inferences may be made if the maximum likelihood estimates are not unique. GRA

N79-14856# Los Alamos Scientific Lab., N. Mex.
TRANSFORMATIONS OF THE MULTIVARIATE NORMAL DISTRIBUTION WITH APPLICATIONS TO SIMULATION
Mark E. Johnson and John S. Ramberg (Iowa Univ., Iowa City) 1978 4 p refs Presented at the 11th Intern. Conf. on System Sci., Honolulu, Hawaii, 5-6 Jan. 1978
(Contract W-7405-eng-36)
(LA-UR-77-2595; Conf-780103-3) Avail: NTIS HC A02/MF A01

Some results on the Johnson transformation system are obtained which can enhance applications of this system in multivariate Monte Carlo simulation studies. The primary contribution is that the mean vector and the covariance matrix in the transformed population can be specified. Applications of this system to Monte Carlo simulation studies is discussed. DOE

N79-14857# Oak Ridge National Lab., Tenn.
APPLICATION OF A TIME-SERIES METHODOLOGY TO FEDERAL PROGRAM ALLOCATIONS
B. H. Bronfman Nov. 1977 18 p refs
(Contract W-7405-eng-26)
(ORNL-TM-6116) Avail: NTIS HC A02/MF A01

Time series analysis provides a useful tool in the evaluation of public policy outputs. It is shown that the general Box and Jenkins method, when extended to allow for multiple interrupts, enables researchers simultaneously to examine changes in drift and level of a series, and to select the best fit model for the series. As applied to urban renewal allocations, results show significant changes in the level of the series, corresponding to changes in party control of the Executive. No support is given to the incrementalism hypotheses as no significant changes in drift are found. DOE

N79-14858# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
RELAXATION OF INITIAL PROBABILITY DENSITY FUNCTIONS IN THE TURBULENT CONVECTION OF SCALAR FIELDS
C. Dopazo 1977 48 p refs Presented at the Workshop on Probability Density Function Methods for Turbulent Flows, Aachen, 29 Aug. - 2 Sep. 1977
(Contract EY-76-C-02-0016)
(BNL-23147; Conf-770841-1) Avail: NTIS HC A03/MF A01

The evolution of an intially binary (zero-unity) scalar field undergoing turbulent and molecular mixing is studied in terms of conservation equations for the probability density function of the scalar property. Attention is focussed on the relaxation of the dynamic system to a state independent of the initial conditions. A few existing methods are discussed and evaluated and a new mechanistic model is proposed. Classical iteration techniques are used to obtain an equation for the single point probability density and the unperturbed Green function. It is argued that it might be necessary to use the true Green function or perturbed propagator of the system to obtain the correct evolution of the probability density function. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N79-14859*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MIKHAILOV STABILITY CRITERION FOR TIME-DELAYED SYSTEMS
L. Keith Barker Jan. 1979 21 p refs
(NASA-TM-78803; L-12281) Avail: NTIS HC A02/MF A01 CSCL 12B

The valid and invalid application of the Mikhailov criterion to linear, time-invariant systems with time delays is discussed. The Mikhailov criterion is a graphical procedure which was developed to examine the stability of linear, time-invariant systems with no time delays. Two equivalent formulations of the criterion are discussed. Results indicate that the first formulation remains valid for time-delayed systems of the retared type, with the understanding that the Mikhailov curve need not necessarily always rotate in the counterclockwise direction for a stable system. Erroneous results in the second formulation are formed when there are time delays in the systems. S.E.S.

N79-14860# Syracuse Univ., N. Y. Dept. of Industrial Engineering and Operations Research.
INTERCHANGEABLE COMPOUNDS AND THINNINGS OF RANDOM MEASURES Interim Report
Richard F. Serfozo Aug. 1978 27 p refs
(Grants AF-AFOSR-2627-74; NSF ENG-75-13653; AF Proj. 2304)
(AD-A059340; AFOSR-78-1346TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Interchangeable thinnings of point processes and random measures are studied as discrete and continuous compound random measures. Conditions are presented under which these compounds and thinning converge in distribution to random measures that are conditionally infinitely divisible with independent increments, e.g., a Poisson process with a random intensity. Also studied are successive ordered thinnings of point processes and random measures that converge to renewal processes and analogous random measures. As special cases, high level exceedances of interchangeable processes are described, and a thinning of point process where the points are inspected over time according to a renewal process is also given. Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N79-14861# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STATIC SUSCEPTIBILITY OF THE ANDERSON MODEL DILUTE MAGNETIC ALLOYS
Ram Kishore Oct. 1978 25 p refs Revised Submitted for publication
(INPE-1382-PE/178) Avail: NTIS HC A02/MF A01

The Anderson model for dilute magnetic alloys is considered, and the functional integral approach is used to calculate the static susceptibility. The Coulomb interaction at the magnetic impurity is represented by the random fields coupled to the charge and the spin fluctuations. On treating the charge fluctuations within external approximation, the free energy function is approximated by its potential plus the (kinetic) harmonic terms. Within this approximation, the functional integral is evaluated over all the paths using matrix transfer techniques. The static susceptibility reduces to an expression of a system of independent particles moving in a one dimensional potential. In a weak coupling limit, it behaves like Pauli susceptibility and coincides with the perturbation theory results. In strong coupling limits, a Kondo effect and Curie susceptibility are obtained.
F.O.S.

N79-14862# Arizona Univ., Tucson.
EXCITATION OF A WIRE IN A RECTANGULAR CAVITY. VOLUME 1. THEORY Final Report
D. B. Seidel Kirtland AFB, N. Mex. AFWL May 1978 98 p refs
(Grant AF-AFOSR-3009-76)
(AD-A059812; AD-E200164; AFWL-TR-77-221-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 20/14

In this work, the problem of determining the currents excited on a wire enclosed within a rectangular cavity is considered. The wire and cavity interior are excited by electromagnetic sources exterior to the cavity which couple to the cavity interior through a small aperture in the cavity wall. It is assumed that the wire is thin, straight and oriented perpendicular to one of the cavity walls. An integral equation is formulated for the problem in the frequency domain using equivalent dipole moments to approximate the effects of the aperture. This integral equation is then solved numerically by the method of moments. The dyadic Green's functions for this problem are difficult to compute numerically; consequently, extensive numerical analysis is necessary to render the solution tractable. Sample numerical results are presented for representative configurations of cavity, wire and aperture, and suggestions for future extensions of this work are discussed. Author (GRA)

N79-14863# Arizona Univ., Tucson.
EXCITATION OF A WIRE IN A RECTANGULAR CAVITY. VOLUME 2: COMPUTER DOCUMENTATION Final Report
D. B. Seidel Kirtland AFB, N. Mex. AFWL May 1978 63 p refs
(Grant AF-AFOSR-3009-76)
(AD-A059813; AD-E200165; AFWL-TR-77-221-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 20/14

In this work, the problem of determining the currents excited on a wire enclosed within a rectangular cavity is considered. The wire and cavity interior are excited by electromagnetic sources exterior to the cavity which couple to the cavity interior through a small aperture in the cavity wall. It is assumed that the wire is thin, straight and oriented perpendicular to one of the cavity walls. An integral equation is formulated for the problem in the frequency domain using equivalent dipole moments to approximate the effects of the aperture. This integral equation is then solved numerically by the method of moments. The dyadic Green's functions for this problem are difficult to compute numerically; consequently, extensive numerical analysis is necessary to render the solution tractable. Sample numerical results are presented for representative configurations of cavity, wire and aperture, and suggestions for future extensions of this work are discussed. Author (GRA)

N79-14864# Ohio Univ., Athens. Dept. of Physics.
STUDIES OF MAGNETIC FLUX AND CRITICAL CURRENT DISTRIBUTIONS NEAR THE SURFACE IN TYPE 2 SUPERCONDUCTORS Final Report
R. W. Rollins Aug. 1978 47 p refs
(Grant AF-AFOSR-2807-75)
(AD-A059643; AFOSR-78-1259TR) Avail: NTIS HC A03/MF A01 CSCL 20/3

Very pure annealed Nb samples were irradiated with 3.2 and 5 McV protons to fluences of about 6.8 x 10(16) p/cm(2). Local magnetic induction profiles, when the samples were in the superconducting mixed state, were obtained using an ac technique. Electron micrographs of the same irradiated samples show dislocation loops in the damaged region of the samples. The critical current and the volume flux pinning force were determined from the slope of the measured field profiles. Assuming pinning due to the observed dislocation loops, the pinning force calculated from a direct summation law is an order of magnitude higher than the experimental result and as calculated from quadratic summation laws is two to three orders of magnitude smaller than measured. Author (GRA)

N79-14865# Naval Research Lab., Washington, D. C. Plasma Physics Div.
FREQUENCY UP-SHIFT FOR CYCLOTRON WAVE INSTABILITY ON A RELATIVISTIC ELECTRON BEAM Interim Report
J. L. Hirshfield, K. R. Chu, and S. Kainer Apr. 1978 8 p refs
(NRL Proj. R08-92; NRL Proj. R08-95; XF54581091)
(AD-A057687; AD-E000177; NRL-TM-3690) Avail: NTIS HC A02/MF A01 CSCL 20/3

The axial drift of a relativistic electron beam along a uniform field is shown theoretically to lead to significant frequency up-shifts for linear cyclotron-wave instabilities driven by velocity-space anisotropy. This mechanism suggests novel means for development of devices for generation of intense far infrared power. Results show that large wave growth can be obtained with an arbitrarily large frequency up-shift for a cold beam and that substantial growth with frequency up-shifts of over a factor of ten are achievable with finite temperature beams. Author

N79-14866# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: PHYSICAL SCIENCES AND TECHNOLOGY, NO. 57
2 Jan. 1979 36 p refs Transl. into ENGLISH from various Russian journals
(JPRS-72547) Copyright. Avail: NTIS HC A03/MF A01

Articles are presented on laser fields, light beams, statistical field phase modulation, and the chromatic properties of coherent optics. For individual titles, see N79-14867 through N79-14870.

N79-14867# Joint Publications Research Service, Arlington, Va.
A UNIVERSAL METHOD FOR THE CONVERSION OF LASER FIELDS WITH COMPLEX TRANSVERSE MODE STRUCTURES **c36**
A. V. Gnatovskiy, A. P. Loginov, M. V. Nikolayev, and M. T. Shpak *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 57 (JPRS-72547) 2 Jan. 1979 p 7-15 refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 23, no. 2, 1978 p 311-317 (For primary document see N79-14866 05-70)
Copyright. Avail: NTIS HC A03/MF A01

The radiation of most lasers has a complex transverse mode structure which results in large divergence of the laser beam

and low special coherence of the light field. To avoid these difficulties, an approach to the formation of improved spatial-angular characteristics is presented. Theoretical prerequisites are discussed. Results indicate that utilization of lasers with poor spatial-angular characteristics with a correction system is practical. F.O.S.

N79-14868# Joint Publications Research Service, Arlington, Va.
REDUCING THE DIVERGENCE OF A LIGHT BEAM AT THE OUTPUT OF A FIBER-OPTIC CABLE c74
A. V. Volyar, A. V. Natovskiy, A. P. Loginov, N. V. Medved, and M. T. Shpak *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 57 (JPRS-72547) 2 Jan. 1979 p 16-19 refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), vol. 23, no. 5, 1978 p 863-866 (For primary document see N79-14866 05-70)
Copyright. Avail: NTIS HC A03/MF A01

Results reported partially illustrate the possibility of improving the output characteristics of light beams passing through a fiber optics cable by means of an interferometric method for converting the coherent light fields, which was employed to correct the radiation having a complex transverse structure, which takes the form of the superposition of gaussian beams of arbitrary orders. The method is based on the conversion of the light field by an optical system consisting of a wave front modulator, in the form of a phase transparency with a specially chosen transmittance factor and an element which accomplishes an integral correlation operation, the angular spectrum of the radiation passing through the system is given. F.O.S.

N79-14869# Joint Publications Research Service, Arlington, Va.
THE APPLICATION OF THE STATISTICAL FIELD PHASE MODULATION METHOD TO PRODUCE HIGHLY DIRECTIONAL LIGHT BEAMS c74
A. V. Gnatovskiy, N. G. Zubrilin, A. P. Loginov, N. V. Medved, M. V. Nikolayev, and M. T. Shpak *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 57 (JPRS-72547) 2 Jan. 1979 p 20-23 refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 23, no. 3, 1978 p 514-516 (For primary document see N79-14866 05-70)
Copyright. Avail: NTIS HC A03/MF A01

A new method is presented for producing a highly directional coherent light beam with the divergence close to the diffraction limit. The method is based on the conversion of a field with arbitrary spatial-angular characteristics using a coherent optical filter. The parameters of the latter are chosen to provide for concentration of the initial radiation in a beam, the angular spectrum of which has the shape of an Airy disc. Theoretical evaluations show that a dual component coherent optical system can be imployed as such a filter. The first element of the system is a diffraction diffuser, which disperses the radiation passing through it in a rather wide solid angle. The use of a phase transparency with a point structure is used as this diffuser, each point of which can be considered an independent radiator having a random amplitude and phase. The second element of the system performs the integral operation for correlation with the field passing through the diffraction scatterer. F.O.S.

N79-14870# Joint Publications Research Service, Arlington, Va.
THE CHROMATIC PROPERTIES OF COHERENT OPTICAL COMPENSATING SYSTEMS c74
A. V. Gnatovskiy, A. P. Loginov, and N. V. Medved *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 57 (JPRS-72547) 2 Jan. 1979 p 24-28 Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 23, no. 7, 1978 p 1217-1219 (For primary document see N79-14866 05-70)
Copyright. Avail: NTIS HC A03/MF A01

The possibilities for improving the spatial-angular characteristics of coherent radiation in a broad spectral range were investigated using the same correcting system, which includes a hologram. The capability of designing universal wideband correcting elements is demonstrated. F.O.S.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N79-14871* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOUND-SUPPRESSING STRUCTURE WITH THERMAL RELIEF Patent
Dudley O. Nash (GE, Cincinnati) and Joseph Holowach, inventors (to NASA) Issued 15 Aug. 1978 5 p Filed 2 Jul. 1976 Sponsored by NASA
(NASA-Case-LEW-12658-1; US-Patent-4,106,587; US-Patent-Appl-SN-702115; US-Patent-Class-181-213; US-Patent-Class-181-222; US-Patent-Class-181-190; US-Patent-Class-181-293) Avail: US Patent and Trademark Office CSCL 20A

Sound-suppressing structure comprising stacked acoustic panels wherein the inner high frequency panel is mounted for thermal expansion with respect to the outer low frequency panel is discussed. Slip joints eliminate the potential for thermal stresses, and a thermal expansion gap between the panels provides for additional relative thermal growth while reducing heat convection into the low frequency panel.

Official Gazette of the U.S. Patent and Trademark Office

N79-14872*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A COMPARISON OF THE NOISE PRODUCED BY A SMALL JET ON A MOVING VEHICLE WITH THAT IN A FREE JET
Thomas D. Norum Dec. 1978 24 p refs
(NASA-TP-1326; L-12383) Avail: NTIS HC A02/MF A01 CSCL 20A

A 2.54 cm (1.00 in.) nozzle supplied with nitrogen was mounted above an automobile and driven over an asphalt roadway past stationary microphones in an attempt to quantify the effects of the vehicle motion on jet mixing noise. The nozzle was then tested in the Langley anechoic noise facility with a large free jet simulating the relative motion. The results are compared for these two methods of investigating forward speed effects on jet mixing noise. The vehicle results indicate a noise with forward speed throughout the Doppler-shifted static spectrum. This decrease across the entire frequency range was also apparent in the free-jet results. The similarity of the results indicates that the effects of flight on jet mixing noise can be predicted by simulation of forward speed with a free jet. Overall sound pressure levels were found to decrease with forward speed at all observation angles for both methods of testing. A.R.H.

N79-14873*# Lockheed-Georgia Co., Marietta.
THE FREE JET AS A SIMULATOR OF FORWARD VELOCITY EFFECTS ON JET NOISE Final Report
K. K. Ahuja, B. J. Tester, and H. K. Tanna Oct. 1978 324 p refs
(Contract NAS3-20050)
(NASA-CR-3056; LG78ER0065) Avail: NTIS HC A14/MF A01 CSCL 20A

A thorough theoretical and experimental study of the effects of the free-jet shear layer on the transmission of sound from a model jet placed within the free jet to the far-field receiver located outside the free-jet flow was conducted. The validity and accuracy of the free-jet flight simulation technique for forward velocity effects on jet noise was evaluated. Transformation charts and a systematic computational procedure for converting measurements from a free-jet simulation to the corresponding results from a wind-tunnel simulation, and, finally, to the flight case were provided. The effects of simulated forward flight on jet mixing noise, internal noise and shock-associated noise from model-scale unheated and heated jets were established experimentally in a free-jet facility. It was illustrated that the existing anomalies between full-scale flight data and model-scale flight simulation data projected to the flight case, could well be due to the contamination of flight data by engine internal noise.

Author

N79-14874*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE TRANSMISSION THROUGH FLAT RECTANGULAR PANELS INTO A CLOSED CAVITY
C. Kearney Barton and Edward F. Daniels Dec. 1978 29 p refs
(NASA-TP-1321; L-12439) Avail: NTIS HC A03/MF A01 CSCL 20A

Five panels backed by a closed cavity were studied experimentally and analytically to determine the noise transmission characteristics of the coupled panel-cavity system. The closed cavity was studied both with and without fiber-glass lining to provide either an absorbent or a reverberant acoustic space. The effects on noise reduction of cavity absorption, measurement location within the cavity, panel mass, and panel stiffness were examined. Results indicated that both measurement location and absorption in the cavity have significant effects on the noise reduction. Increasing panel mass improves the noise reduction at almost all frequencies, and increasing panel stiffness improves nose reduction below the fundamental resonance frequency. A simple, one dimensional analytical model was developed which provided good agreement with the experimental results. A.R.H.

N79-14875*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
BASIC RESEARCH IN FAN SOURCE NOISE: INLET DISTORTION AND TURBULENCE NOISE Final Report, 16 Sep. 1976 - 16 Apr. 1978
R. A. Kantola and R. E. Warren Dec. 1978 161 p refs
(Contract NAS3-17853)
(NASA-CR-159451; SRD-78-186) Avail: NTIS HC A08/MF A01 CSCL 20A

A widely recognized problem in jet engine fan noise is the discrepancy between inflight and static tests. This discrepancy consists of blade passing frequency tones, caused by ingested turbulence that appear in the static tests but not in flight. To reduce the ingested distortions and turbulence in an anechoic chamber, a reverse cone inlet is used to guide the air into the fan. This inlet also has provisions for boundary layer suction and is used in conjunction with a turbulence control structure (TCS) to condition the air impinging on the fan. The program was very successful in reducing the ingested turbulence, to the point where reductions in the acoustic power at blade passing frequency are as high as 18 db for subsonic tip speeds. Even with this large subsonic tone suppression, the supersonic tip speed tonal content remains largely unchanged, indicating that the TCS did not appreciably attenuate the noise but effects the generation via turbulence reduction. Turbulence mapping of the inlet confirmed that the tone reductions are due to a reduction in turbulence, as the low frequency power spectra of the streamwise and transverse turbulence were reduced by up to ten times and 100 times, respectively. F.O.S.

N79-14876# Federal Aviation Administration, Washington, D. C.
FAA INTEGRATED NOISE MODEL VERSION 1, BASIC USER'S GUIDE
Dec. 1977 114 p
(AD-A052790; FAA-EQ-78-01) Avail: NTIS HC A06/MF A01 CSCL 20/1

The document contains a basic description of the application of the Integrated Noise Model, (INM), Version 1. The INM is a collection of computer programs which can be used to simulate aircraft operations at airports and display the noise contribution of those operations to the environment in the vicinity of the airport. The INM consists of three nonconversational applications programs which are executed without any direct interaction with either the user or the operations system under which they are run. The three applications models are: The Grid Analysis Model; The Contour Analysis Model; and The Contour Plotting Package. For acceptable definitions of aircraft operations, the model is capable of computing any or all of the following noise exposure measures: Noise Exposure Forecast (NEF); Equivalent Sound Level (Leq); Day Night Average Sound Level (Ldn); Community Noise Equivalent Level (CNEL); and Time above a Threshold of A-Weighted Sound Level (TA). The document is designed to serve as a guide for the user, management personnel, and the consultant. This guide will provide the means of applying the INM without the use of sophisticated forms or processes. GRA

N79-14877# Pennsylvania State Univ., State College. Applied Research Lab.
ON THE RADIATED NOISE DUE TO BOUNDARY-LAYER TRANSITION
G. C. Lauchle 28 Jul. 1978 52 p refs
(Contract N00017-73-C-1418)
(AD-A059858; ARL/PSU/TM-78-204) Avail: NTIS HC A04/MF A01 CSCL 20/1

A theory is presented for the noise radiated by incompressible boundary-layer transition that occurs on an infinite, rigid flat plate. It is hypothesized that it is the intermittency of the boundary-layer flow within the transition zone that is dominant in noise production. Using Lighthill's analogy, it is shown that dipole, quadrupole, and octupole sources are generated. Under the assumption of low Mach number flow, the power spectral density per unit spanwise width of transition for the radiated acoustic pressure is derived for the dipole contribution (which is acoustically more efficient than the other sources by a factor inversely proportional to the Mach number squared). The spectral shape corresponds to one obtained by passing white noise through a realizable bandpass filter. The low-frequency cutoff scales with the burst frequency associated with turbulent spot formation, and the high-frequency cutoff scales inversely with the time required for the wall shear stress to change from a laminar value to a turbulent value at a given point of local laminar flow breakdown. As one example, the theory is used to predict the noise radiated by an under-water buoyant body for which there are experimental data. GRA

N79-14878# Pennsylvania State Univ., University Park. Applied Research Lab.
UNDERWATER ACOUSTIC ABSORPTION CHARACTERISTICS OF COMPOSITES OF WOOD, RUBBER, AND STEEL
F. A. Barge May 1978 77 p refs
(Contract N00017-73-C-1418)
(AD-A059328; ARL/PSU/TM-78-52) Avail: NTIS HC A05/MF A01 CSCL 20/1

In this experimental investigation, the underwater acoustic absorption characteristics of composites of various species of wood, rubber, and steel were determined under low hydrostatic pressure and over a frequency range of 10 to 50 kHz. The test samples included a thin steel plate, closed-cell bubble rubber (Rubatex), hemlock, fir plywood, white pine, redwood and Saper-T rubber. Composites of these materials were tested in a semi-anechoic water tank, where the technique used to determine the incident and reflected pressure amplitudes was the tone-burst method. The complex reflection factor for normal incidence, calculated from the standing waves measured in front of each sample at discrete frequencies, was determined for each composite over the frequency range of interest. The bubble rubber-steel composite was found to have the highest reflection factor over the frequency range of measurement; however, when reversed (steel-bubble rubber), very low reflection factors were measured, but the data were difficult to repeat. Consistently low reflection factors (R approximately 0.5) were measured for the fir plywood-steel-bubble rubber composite and for the Saper-T rubber-steel-bubble rubber composite. In general, the other soft woods evaluated were found to be resonant-type absorbers, although the broadband reflection factor did decrease by approximately 20 to 30 percent when a layer of Saper-T rubber was included in the composite. Author (GRA)

N79-14879# Aeronautical Research Labs., Melbourne (Australia).
CRACK DEPTH MEASUREMENT BY ULTRASONICS
P. A. Doyle and C. M. Scala Dec. 1977 23 p refs
(AD-A058485; ARL/MAT-107) Avail: NTIS HC A02/MF A01 CSCL 20/11

A review is given of both bulk and surface wave ultrasonic methods for the measurement of the depth of surface-breaking cracks. Research is considered which relates to techniques for measuring crack depth by studying the scattered pulse amplitude, by using time-of-flight methods, or by carrying out ultrasonic spectroscopic analysis. Measurement of the transit time of bulk waves appears most likely to provide simple and reliable depth measurement in the near future, although further work in other

two areas should lead to the development of valuable techniques. Some suggestions are made of promising directions for future research. Author (GRA)

N79-14987# Joint Publications Research Service, Arlington, Va.
DIFFRACTION OF LIGHT IN ACOUSTIC SURFACE WAVES
Yu. I. Posudin and V. G. Grits *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 14-17 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 93-95 (For primary document see N79-14983 05-99)
Copyright. Avail: NTIS HC A05/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N79-14880# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
QUASI-PARTICLE SPECTRUM OF THE HUBBARD MODEL: STRONG INTRA ATOMIC INTERACTION LIMIT
Ram Kishore and Arnobio R. dos Santos Nov. 1978 15 p refs
(INPE-1388-PE/180) Avail: NTIS HC A02/MF A01

A self consistent many body theory was used to calculate the quasi-particle spectrum of the Hubbard model, in the limit of strong intraatomic interaction. The quasi-particle energy of each band of the spectrum, consisting of two bands, is calculated exactly up to linear terms in the hopping integral. J.M.S.

N79-14881# IRT Corp., San Diego, Calif.
MOLECULAR BEAM STUDIES OF LOW ENERGY REACTIONS Annual Summary Report
R. H. Neynaber and S. Y. Tang 2 Oct. 1978 6 p refs
(Contract N00014-74-C-0011)
(AD-A059845; IRT-8103-008) Avail: NTIS HC A02/MF A01 CSCL 20/8

Chemi-ionization and ion-molecule reactions involving metastable and ground-state atoms are studied by both crossed and merging beams at low relative energies (i.e., 0.01 to 10 or 20 eV). Author (GRA)

N79-14882# Worcester Polytechnic Inst., Mass.
THE GAS PHASE RADIOLYSIS AND VACUUM ULTRAVIOLET PHOTOLYSIS OF HETEROCYCLIC ORGANIC COMPOUNDS Progress Report, 1 May 1976 - 1 Feb. 1977
Alfred A. Scala, I. Colon, D. Salomon, D. Billings, R. Mank, and C. Bellemer 1977 21 p refs
(Contract E(11-1)-3569)
(COO-3569-7) Avail: NTIS HC A02/MF A01

The long range objective of our research is the determination of the modes of decomposition of highly electronically excited molecules and ions, produced when complex organic molecules absorb large amounts of energy. The results are reported of work in five particular areas: (1) the mass spectra of four-membered alicyclic sulfur compounds; (2) the vacuum ultraviolet photolysis of trimethylene sulfone; (3) the gas phase photolysis and gamma radiolysis of ethylenimine; (4) the correlation of ionization cross-section with polarizability; and (5) the role of radiation damaged solids in the biological experiments of Vikings 1 and 2. DOE

N79-14883# Rochester Univ., N. Y. Dept. of Chemistry.
NUCLEAR REACTION MECHANISMS Progress Report, Jun. 1976 - Jul. 1977
M. Blann 1977 144 p refs Sponsored by DOE
(COO-3494-32) Avail: NTIS HC A07/MF A01

Experimental measurement and the theoretical interpretation of heavy ion induced reactions are discussed. Information on fusion barrier heights and radii, nucleus-nucleus potentials and fission parameterizations at high angular momenta was extracted from measurements of elastic scattering, evaporation residue, fission, quasi elastic and deep inelastic scattering cross sections. The influence of excitation energies on inverse cross sections and of precompound decay in heavy ion reactions, is examined. Multidimensional potential energy surfaces for heavy ion collisions are studied. DOE

N79-14884# California Univ., Livermore. Lawrence Livermore Lab.
REVERSED FIELD VLASOV EQUILIBRIA AND ORBITS IN 2D AXISYMMETRIC 2XIIB CONFIGURATIONS
D. V. Anderson and R. F. Post 24 Oct. 1977 33 p
(Contract W-7405-eng-48)
(UCRL-79844; Conf-771136-2) Avail: NTIS HC A03/MF A01

The details of the ion distribution function are important in determining the volume of and degree of field reversal. To show some of these dependencies the double delta function distribution function f=delta (E-E sub o) delta (P sub c - P sub co) where E and P sub c are the particle energy and the canonical angular momentum respectively is used. Electrons are ignored except for providing charge neutrality. Results of a parameter study from the two dimensional axisymmetric equilibrium code CYLEQ show how field reversal is related to the radius, length, rotation, total number and energy of the plasma ions. Optimal injection strategies are presented which lead to plasma distributions with good reversal. Particle orbits conforming to this distribution function are displayed. DOE

N79-14885# Los Alamos Scientific Lab., N. Mex.
STEADY-STATE TEMPERATURE AND STRESS DISTRIBUTIONS OF A PROPOSED LAMPF PYROLYTIC GRAPHITE PION PRODUCTION TARGET
Lloyd O. Lindquist and Edward C. Scarbrough Nov. 1977 27 p refs
(Contract W-7405-eng-36)
(LA-6936-MS) Avail: NTIS HC A03/MF A01

Two target configurations, suitable for the Clinton P. Anderson Meson Physics Facility (LAMPF) pion production sites, are analyzed for maximum temperatures and stresses to be experienced at LAMPF's design current (800 MeV protons at 1 mA average current). A steady-state analysis is performed using the computer code TSAAS. The pulsed nature of the beam is not considered (6% duty). Both targets are pyrolytic graphite. One is cooled by water flowing through copper tubes bonded to the graphite; the other is cooled by water flowing through holes drilled in a copper layer bonded to the graphite. Results of both analyses indicate that the calculated maximum stresses in the heated zone and at the copper/graphite interface due to proton beam heating are substantially lower than published values of the ultimate tensile and compressive strengths of pyrolytic graphite and copper. The calculated hot-spot temperatures are below the maximum temperature allowed by evaporation loss considerations. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N79-14886 Yale Univ., New Haven, Conn.
MEASUREMENT OF VECTOR MESON PRODUCTION IN PROTON-PROTON COLLISIONS AT THE CERN ISR Ph.D. Thesis
Andrew James Lankford 1978 312 p
Avail: Univ. Microfilms Order No. 7820147

The production at large transverse momentum of low mass electron pairs was investigated using lithium/xenon transition radiation detectors and liquid argon calorimeters. Production of the vector mesons neutral rho, neutral omega, and o was observed with cross-sections consistent with the assumptions that neutral rho, neutral omega, and no production are nearly equal at large pt and the o production is suppressed by about an order of magnitude relative to neutral rho, neutral omega, and production.

The observed low mass virtual photon continuum between masses of 200 and 500 MeV was consistent with estimates of Dalitz decay plus predictions of the vector dominance model. The measured cross-section for virtual photon production enabled a limit of (0.5 + or 1.0)% to be placed on the ratio of direct real photon production to n o production. Author

N79-14887*# National Aeronautics and Space Administration, Washington, D. C.
UTILIZATION OF NUCLEAR METHODS FOR MATERIALS ANALYSIS AND THE DETERMINATION OF CONCENTRATION GRADIENTS
R. Darras Jan. 1979 26 p Transl. into ENGLISH from Mem. Sci. Rev. Met. (France), v. 75, no. 6, Jun. 1978 p 345-353 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Nucl. and Isotopic Chem. Res. and Analysis Div., Saclay Nucl. Res. Center, Gif-sur-Yvette, France
(Contract NASw-3199)
(NASA-TM-75363) Avail: NTIS HC A03/MF A01 CSCL 07D

The various types of nuclear chemical analysis methods are discussed. The possibilities of analysis through activation and direct observation of nuclear reactions are described. Such methods make it possible to analyze trace elements and impurities with selectivity, accuracy, and a high degree of sensitivity. Such methods are used in measuring major elements present in materials which are available for analysis only in small quantities. These methods are well suited to superficial analyses and to determination of concentration gradients; provided the nature and energy of the incident particles are chosen judiciously. Typical examples of steels, pure iron and refractory metals are illustrated. S.E.S.

N79-14888# Washington Univ., Seattle. Dept. of Chemistry.
DO HIGHLY EXCITED REACTIVE POLYATOMIC MOLECULES BEHAVE ERGODICALLY?
I. Oref (Technion - Israel Inst. of Tech.) and B. S. Rabinovitch 1 Oct. 1978 33 p refs Submitted for publication
(Contract N00014-75-C-0690)
(AD-A060118; NR092-549-TR07) Avail: NTIS HC A03/MF A01 CSCL 07/4

Existing literature is surveyed and critically analyzed. A variety of excitation techniques including crossed molecular beam, laser, photochemical, chemical activation and thermal are considered. Models of collisional perturbation relaxation and energy transfer are compared with literature evidence. The answer to the title question is yes. Author (GRA)

N79-14889# Maryland Univ., College Park. Dept. of Physics and Astronomy.
HIGH INTENSITY ELECTRON BEAM PROPAGATION BETWEEN TWO PLANE CONDUCTORS AND ITS IMPLICATIONS FOR COLLECTIVE ION ACCELERATION
Han S. Uhm and Hogil Kim 1978 28 p refs
(AD-A059337; Pub-78-243) Avail: NTIS HC A03/MF A01 CSCL 20/7

This paper examines the properties of a high intensity relativistic electron beam propagating between two grounded plane conductors, with particular emphasis on the implications for collective ion acceleration. The steady-state and time averaged equilibrium properties are obtained analytically, by employing a one-dimensional model. Numerical integration of pulsed-beam propagation is shown to result in an oscillatory state around the time averaged equilibrium solution. Based on this investigation, a model of linear beam collective ion acceleration is presented. It is shown that within a few nanoseconds of acceleration time, the ion kinetic energy can be increased to more than ten times electron energy. Author (GRA)

N79-14890# Oak Ridge National Lab., Tenn.
GAS-COOLED FAST REACTOR PROGRAM Progress Report, 1 Jul. 1975 - 31 Dec. 1976
Dec. 1977 221 p refs
(Contract W-7405-eng-26)
(ORNL-5294) Avail: NTIS HC A10/MF A01

The Core Flow Test Loop (CFTL) is a high-temperature, high-pressure, fast-transient helium circulating loop. Its data acquisition system is commensurate with the need to follow and record the fast transients which are simulating accident conditions of the GCFR. The fuel is simulated by electrically heated fuel-rod simulators providing an exact simulation from the cladding onward. Conceptual design of the test bundle and test section centered on inlet and outlet plenums, as well as the inlet section required to establish fully developed flow. Spurious motions of the fuel-rod simulators were analyzed. The calculated cumulative movement associated with the spurious motion, even over a large number of cycles, for a single experiment is below 12 mm. The amplitude of the oscillatory motion is less than 1 micrometer. DOE

74 OPTICS

Includes light phenomena.

N79-14891* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PARTIAL POLARIZER FILTER Patent
Alan M. Title, inventor (to NASA) (Lockheed Missiles and Space Co., Sunnyvale, Calif.) Issued 12 Dec. 1978 6 p Filed 11 Aug. 1977 Supersedes N77-30935 (15 - 21, p 2865) Sponsored by NASA
(NASA-Case-GSC-12225-1; US-Patent-4,129,357; US-Patent-Appl-SN-823566; US-Patent-Class-350-157) Avail: US Patent and Trademark Office CSCL 20F

A birefringent filter module comprises, in seriatum; (1) an entrance polarizer, (2) a first birefringent crystal responsive to optical energy exiting the entrance polarizer, (3) a partial polarizer responsive to optical energy exiting the first polarizer, (4) a second birefringent crystal responsive to optical energy exiting the partial polarizer, and (5) an exit polarizer. The first and second birefringent crystals have fast axes disposed + or -45 deg from the high transmitivity direction of the partial polarizer. Preferably, the second crystal has a length 1/2 that of the first crystal and the high transmitivity direction of the partial polarizer is nine times as great as the low transmitivity direction. To provide tuning, the polarizations of the energy entering the first crystal and leaving the second crystal are varied by either rotating the entrance and exit polarizers, or by sandwiching the entrance and exit polarizers between pairs of half wave plates that are rotated relative to the polarizers. A plurality of the filter modules may be cascaded.
Official Gazette of the U.S. Patent and Trademark Office

N79-14892*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHROMATICALLY CORRECTED VIRTUAL IMAGE DISPLAY Patent Application
William M. Kahlbaum, Jr., inventor (to NASA) Filed 23 Oct. 1978 8 p
(NASA-Case-LAR-12251-1; US-Patent-Appl-SN-953389) Avail: NTIS HC A02/MF A01 CSCL 20F

An in-line, optical display lens comprising a front convex-convex element, a central convex-concave element, and a rear convex-convex element was designed for use in the flight simulators, which require presentation of a realistic visual display to the pilot operating the flight simulator. The lens, located between the pilot operating the simulator and a closed circuit television monitor or similar device, serves to magnify the image and causes the image to appear to be at a distance. The specific radius of curvature of the lens elements, precise lens element spacing and thickness, and the indices of refraction for the lens elements, relieve eye strain on a pilot during operation of a flight simulator. The use of acrylic and polystryrene elements results in a lens that is both lighter in weight and less expensive than similar lens made with glass elements. NASA

N79-14893*# Lumin, Inc., Tuscaloosa, Ala.
INDEPENDENT APPRAISAL OF THE MSFC OPTICAL DATA REDUCTION SCHEMES Final Report
Hua-Kuang Liu 30 Nov. 1978 8 p
(Contract NAS8-33192)
(NASA-CR-150879; LUMIN-130-78) Avail: NTIS HC A02/MF A01 CSCL 20F

A few state-of-the-art optical image processing techniques are described and their potential applications to the ACPL

experiments are suggested. The discussion also includes the selection of recording media in the present system and the enhancement of signal-to-noise ratio for the expected data from ACPL. Author

N79-14894# Systems Research Labs., Inc., Dayton, Ohio.
ELECTRO-OPTICAL SURVEILLANCE SENSOR AND TECHNIQUES EVALUATION Final Report, Jan. 1974 - Sep. 1975
John Sellers Wright-Patterson AFB AFAL Jul. 1978 50 p refs
(Contract F33615-74-C-1080; AF Proj. 7660)
(AD-A059353; AFAL-TR-78-21) Avail: NTIS HC A03/MF A01 CSCL 15/3

In support of efforts to evaluate television pickup tubes and methods of image processing to detect moving space targets against the background star field, several individual engineering tasks were performed to apply automation to a small astronomical telescope (63.5 cm aperture) and to a data recording console. This effort required circuit design and integration in both analog and digital subsystems. In a second major phase of this contract, another small optical system (61 cm aperture), mounted on a special servo-controlled tracking mount, was integrated with an existing process-control digital computer so as to replace or supplant the existing analog control system with a more precise digital control and data recording system. This report summarizes the efforts undertaken. Detailed results of the television camera, MTI device, and technique evaluations, as well as the detailed software/hardware systems are reported elsewhere. Author (GRA)

N79-14895# Battelle Columbus Labs., Ohio.
OPTICAL WAVEGUIDE GEODESIC LENSES Final Report, 30 May 1977 - 31 Mar. 1978
David W. Vahey Jun. 1978 72 p refs
(Contract F33615-77-C-1153; AF Proj. 2001)
(AD-A059410; AFAL-TR-78-85) Avail: NTIS HC A04/MF A01 CSCL 20/6

The goal of this program was the development of near diffraction-limited optical waveguide geodesic lenses. The means selected for achieving this goal was the formation of corrective waveguide overlays adjacent to spherical-depression lenses. Theoretical analyses of design criteria and fabrication tolerances for these overlays, called corrector plates, were carried out. Measurement techniques for experimentally determining design parameters were developed and implemented, thus minimizing the need for precise knowledge of lens and waveguide characteristics. Depression generation and polishing procedures were varied to enable the fabrication of Ti-diffused $LiNbO_3$ waveguides of high optical quality, albeit at some loss of lens figure. Lenses were evaluated using focal images of prism output-coupled light. Aberrations induced during prism output coupling were taken into account theoretically. In the case of a 55 mm focal-length lens, we observed near diffraction-limited f/19 performance over a full field of view exceeding 1.22 deg. The full width of the central peak was 13.25 micrometers, about 17% above the diffraction-limited value for a 2.9 mm input aperture. The corrector-plate concept was found to be potentially useful in reducing the severe tolerance requirements associated with optical waveguide lens fabrication, and consequently should be an important feature of integrated optical signal-processing systems. Author (GRA)

N79-14896# Air Force Geophysics Lab., Hanscom AFB, Mass.
CLEANLINESS CONSIDERATIONS FOR THE AFGL INFRARED CELESTIAL SURVEY EXPERIMENTS
Stephan D. Price, Charles V. Cunniff, and Russell G. Walker 6 Jul. 1978 24 p refs
(AD-A060116; AFGL-TR-78-0171; AFGL-IP-269) Avail: NTIS HC A02/MF A01 CSCL 17/5

Spaceborne cryogenically cooled infrared telescope systems are optically sensitive to particulate contamination along the line of sight. Methods of cleaning and handling flight instrumentation have been developed at AFGL and used on the Infrared Celestial Survey Program. These procedures are described in detail and flight results are presented. Author (GRA)

N79-14897# Science Applications, Inc., Albuquerque, N. Mex.
INFRARED SEARCH AND TRACK EVALUATION MODEL (IRSTEM) Final Report
L. N. Peckham and L. L. Doran Aug. 1978 197 p refs
(Contract N00173-77-C-0236)
(AD-A060174; SAI-A64-995-199) Avail: NTIS HC A09/MF A01 CSCL 17/5

This report is the final report covering work performed for the Electro-Optical Technology Program Office at the Naval Research Laboratory under Contract N00173-77-C-0236. The purpose of this contract is to develop a system-level computer code to evaluate the performance of Infrared Search and Track systems. The Infrared Search and Track System Evaluation Model (IRSTEM) resulting from this contract is a deterministic code which models the background scene, atmospheric effects, sensor design characteristics and allows flexibility of incorporating a variety of signal processing options. This report summarizes the work documented in the three quarterly reports submitted under this contract and provides a summary of the theory behind the models used in IRSTEM, a program summary and a user's manual with sample programs. GRA

N79-14898# Varian Associates, Palo Alto, Calif.
THE 1.06 MICRON III-V PHOTOCATHODE DEVELOPMENT Annual Technical Report, Nov. 1976 - Nov. 1977
J. S. Escher, P. E. Gregory, S. B. Hyder, and R. R. Saxena Wright-Patterson AFB, Ohio AFAL May 1978 96 p refs
(Contract F33615-76-C-1351; AF Proj. 2001)
(AD-A059960; AFAL-TR-78-78) Avail: NTIS HC A05/MF A01 CSCL 17/5

The design, fabrication, and initial evaluation of three transferred-electron (field assisted) photocathodes for high performance 1.06 micron detection are reported. 2.7% and 2.8% yields at 1.06 have been achieved from a direct emitter and a hybrid InP/InGaAsP heterojunction cathode, respectively. Feasibility of p-InGaP as a transferred-electron emitter has been demonstrated. Author (GRA)

N79-14899# Scripps Institution of Oceanography, La Jolla, Calif. Visibility Lab.
A MICROPROCESSOR CONTROLLED INSTRUMENT FOR MEASURING THE TRANSMITTANCE AND REFLECTANCE OF OCEAN WATERS Final Report
R. W. Austin and R. L. Ensminger Aug. 1978 17 p refs Presented at the 22d Ann. APIE Symp., Ocean Optics V, San Diego, Calif., 30-31 Aug. 1978
(Contract N68463-77-C-0034)
(AD-A060170; SIO-78-23) Avail: NTIS HC A02/MF A01 CSCL 20/6

The factors contributing to the visibility of submerged targets are discussed and the data requirements for calculating submerged contrast and contrast transmittance are developed. An instrument capable of making the measurements of the optical properties of seawater needed for visibility calculations is described. The instrument incorporates proven features of previous spectral transmissometers and oceanographic illuminometers into a single unit that can be operated through standard STD cables up to 8000 meters in length. It can, as a result, be used on most oceanographic vessels without requiring the addition of a special winch and cable. The instrument system utilizes a unique microprocessor-controlled, digital data acquisition and command system. This system performs the control and data transmission functions for eight underwater data channels through the armored, single wire STD cable. The total instrument system includes an HP9830 B desk-top computer for data processing and recording, with an interconnected plotter for the real-time plotting of the measured variables. Author (GRA)

N79-14868# Joint Publications Research Service, Arlington, Va.
REDUCING THE DIVERGENCE OF A LIGHT BEAM AT THE OUTPUT OF A FIBER-OPTIC CABLE
A. V. Volyar, A. V. Natovskiy, A. P. Loginov, N. V. Medved, and M. T. Shpak *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 57 (JPRS-72547) 2 Jan. 1979 p 16-19 refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), vol. 23, no. 5, 1978 p 863-866 (For primary document see N79-14866

05-70)
Copyright. Avail: NTIS HC A03/MF A01

N79-14869# Joint Publications Research Service, Arlington, Va.
THE APPLICATION OF THE STATISTICAL FIELD PHASE MODULATION METHOD TO PRODUCE HIGHLY DIRECTIONAL LIGHT BEAMS
A. V. Gnatovskiy, N. G. Zubrilin, A. P. Loginov, N. V. Medved, M. V. Nikolayev, and M. T. Shpak *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 57 (JPRS-72547) 2 Jan. 1979 p 20-23 refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 23, no. 3, 1978 p 514-516 (For primary document see N79-14866 05-70)
Copyright. Avail: NTIS HC A03/MF A01

N79-14870# Joint Publications Research Service, Arlington, Va.
THE CHROMATIC PROPERTIES OF COHERENT OPTICAL COMPENSATING SYSTEMS
A. V. Gnatovskiy, A. P. Loginov, and N. V. Medved *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 57 (JPRS-72547) 2 Jan. 1979 p 24-28 Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 23, no. 7, 1978 p 1217-1219 (For primary document see N79-14866 05-70)
Copyright. Avail: NTIS HC A03/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N79-14900# Naval Research Lab., Washington, D. C.
EMISSION OF ENERGETIC ELECTRONS FROM A Nd-LASER-PRODUCED PLASMA **Interim Report**
C. M. Armstrong, B. H. Ripin, F. C. Young, R. Decoster, R. R. Whitlock, and S. E. Booner Aug. 1978 22 p refs Sponsored in part by DOE
(AD-A059877; NRL-MR-3829) Avail: NTIS HC A02/MF A01 CSCL 20/9

Absolute spectral measurements of 50-500 keV electrons emitted from a Nd-laser-produced plasma are presented. For normally incident irradiation (10 to the 15th power to 10th to the 16th power W/sq.cm.) onto polystyrene slab targets a total emission of about 10 to the 10th power electrons is inferred with a total emitted energy of about 0.2 mJ. The electron emission is observed to be almost the same both in and out of the plane of polarization. Properties of the emitted spectrum, such as spectral hardness and intensity are observed to be dependent on pulse shape and target material. Author (GRA)

N79-14901# Oak Ridge National Lab., Tenn.
AN INVESTIGATION OF HIGH ENERGY RUNAWAY ELECTRON CONFINEMENT IN THE OAK RIDGE TOKAMAK **Ph.D. Thesis**
Stewart Jay Zweben Nov. 1977 287 p refs Sponsored by DOE
(ORNL/TM-6030) Avail: NTIS HC A13/MF A01

High energy runaway electrons in a Tokamak were investigated through measurement of the bremsstrahlung produced when these electrons leave the discharge and strike the limiting aperture of the torus. The experimental results were interpreted in terms of a classical single-particle model appropriate for collisionless particles in a Tokamak, and it was found that most of the confinement properties of high energy runaways can be understood on this basis. An experiment designed to directly test this model disclosed an anomalous transport which is described by a runaway diffusion coefficient appropriate for runaways near the outside of the plasma. A discussion of the possible mechanisms for this anomalous transport is given. DOE

N79-14902# Oak Ridge National Lab., Tenn.
TOKAMAKS HEATED TO HIGH BETA
R. A. Dory, D. P. Berger, L. A. Charlton, J. T. Hogan, J. K. Munro, D. B. Nelson, Y. K. M. Peng, D. J. Sigmar, and D. J. Strickler Jul. 1978 46 p refs
(Contract W-7405-eng-26)
(ORNL-TM-6434) Avail: NTIS HC A03/MF A01

Intense plasma heating (neutral beam, wave, alpha ...) makes high energy density Tokamaks possible. This paper treats the reaction of plasma which is heated to values of beta in the range of 5 to 15%. DOE

N79-14903# Oak Ridge National Lab., Tenn.
IMPROVED EIGENVALUE EQUATIONS FOR THE COLLISIONLESS DRIFT INSTABILITY IN TOKAMAKS
P. J. Catto and K. T. Tsang Nov. 1977 23 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6045) Avail: NTIS HC A02/MF A01

The validity of the perturbation theory technique of solving the radial differential equation for the collisionless drift wave a Tokamak only near marginal stability for the most unstable radial eigenmode is reviewed. More exact eigenvalue equations (for all even and odd spatial modes) that are valid for arbitrary growth rates are determined. Away from and perphaps near marginal stability, these more complete eigenvalue equations are required in order to accurately calculate growth rates. DOE

N79-14904# Columbia Univ., New York.
EFFECT OF HYDROGEN (DEUTERIUM) ON PROPERTIES OF FUSION POWER REACTOR FIRST WALL ALLOYS
N. F. Panayotou, J. K. Tien, and R. A. Gross 1977 12 p refs Presented at the 2nd Intern. Congr. on Hydrogen in Metals, Paris, 6-11 Jun. 1977
(Contract EY-76-S-02-2456)
(COO-4393-01; Conf-770613-4) Avail: NTIS HC A02/MF A01

Candidate first wall fusion reactor materials were subjected to a deuterium bombardment compared to that of anticipated reactors. Significant microstructural and mechanical damage modes were observed. The mechanics involved and the relevance of deuterium interactions to fusion are discussed. DOE

N79-14905# Illinois Univ., Urbana. Nuclear Engineering Lab.
BURN STABILITY IN A REVERSED FIELD PINCH
H. R. Stimpson and George H. Miley 1977 5 p refs Sponsored by DOE
(COO-2218-90; Conf-771109-40) Avail: NTIS HC A02/MF A01

A global computer model which simulates the burn of a plasma in a reversed field pinch (RFP) device was developed and applied to various prospective methods of prolonging plasma stability. The applied voltage and magnetic field can be input directly because the code uses a unique plasma model incorporating a helical current form to calculate Theta (analogous to q for Tokamaks). Results show that the plasma radius and applied magnetic field have a strong influence on Theta at the time of peak voltage; consequently, careful selection of these parameters is crucial if an extended burn period and the associated enhanced energy multiplication are to be achieved. F.O.S.

N79-14265# Joint Publications Research Service, Arlington, Va.
PLASMA CUTTING AND WELDING
V. Orlov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 55 (JPRS-72351) 1 Dec. 1978 p 51-60 Transl. into ENGLISH from Tekhn. i Nauka (Moscow), no. 7, Jul. 1978 p 2-5 (For primary document see N79-14257 05-31)
Copyright. Avail: NTIS HC A04/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.
For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N79-14906* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MULTILEVEL METALLIZATION METHOD FOR FABRICATING A METAL OXIDE SEMICONDUCTOR DEVICE **Patent**

Ben R. Hollis, Jr., William R. Feltner, David L. Bouldin, and Donald E. Routh, inventors (to NASA) Issued 5 Sep. 1978 8 p Filed 8 Jul. 1977 Supersedes N77-27308 (15 - 18, p 2377)
(NASA-Case-MFS-23541-1; US-Patent-4,111,775; US-Patent-Appl-SN-814005; US-Patent-Class-204-192C) Avail: US Patent and Trademark Office CSCL 20L

An improved method is described of constructing a metal oxide semiconductor device having multiple layers of metal deposited by dc magnetron sputtering at low dc voltages and low substrate temperatures. The method provides multilevel interconnections and cross over between individual circuit elements in integrated circuits without significantly reducing the reliability or seriously affecting the yield.
Official Gazette of the U.S. Patent and Trademark Office

N79-14907# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Service.
LANGMUIR'S CLOSED CYCLE AS TRANSPORT MECHANISM FOR THE GROWTH OF TUNGSTEN MONOCRYSTALS IN A GAS MIXTURE OF 80% N2 AND 20% H2
M. Prager 1978 18 p refs Transl. into ENGLISH from J. Cryst. Growth (Neth.), no. 22, 1974 p 6-12
(CSIR-Trans-1410) Avail: NTIS HC A02/MF A01

In order to test whether Langmuir's closed cycle plays a part in crystal formation, two forming vessels were connected in series so that both tungsten tips were then in the same gas stream. The same current was passed through them, heating them to the same temperature. The gas was fed over a coiled filament between the two flasks so that any O2 present could react with the H2 of the gas mixture to form H2O. A cold trap at the temperature of liquid air and a filter charged with P2O5 should then remove any water in the gas stream. The H2O content of the gas then dropped to 1 vpm. Because of the smaller H2O content of the purified gas mixture, formation of the rhombic dodecahedron at the original tungsten monocrystal sphere of tip 2 is not so clearly defined as the sphere at tip 1 which was glowed in a gas mixture richer in H2O. A.R.H.

N79-14908*# National Aeronautics and Space Administration. Pasadena Office, Calif.
PHOTOMECHANICAL TRANSDUCER Patent Application
Robert F. Fedors (JPL) and Mohammad N. Sarbolouki, inventors (to NASA) (JPL) Filed 15 Dec. 1978 14 p
(Contract NAS7-100)
(NASA-Case-NPO-14363-1; US-Patent-Appl-SN-969760) Avail: NTIS HC A02/MF A01 CSCL 20L

A single, low cost, non-electrical photomechanical transducer is described which comprises an ultrathin strip of polymeric or metallic film having an efficient absorptive surface. When the strip is held under small and constant strain in a stress-strain analyzer, the strip responds to light in a quick and reversible manner. The absorptive face of a rectangular test strip is mounted toward an illumination source. One end of the strip is clamped and screwed to a movable support; the other is attached to a strain gage by a clamp and a lead. The strain gage is connected to a chart recorder which contains typical amplification and graphic instrumentation. A mask placed across the strip provides a controlled illumination area. Many different measuring, switching and prime mover devices can be constructed based on this simple transduction. NASA

N79-14909# National Bureau of Standards, Washington, D. C.
MOLECULAR DYNAMICAL CALCULATIONS OF ENERGY TRANSPORT IN SOLIDS Final Report, 1 Aug. 1975 - 31 Jul. 1978
D. H. Tsai Aug. 1978 9 p
(ARO MIPR 2-76; ARO MIPR 20-77)
(AD-A059356; ARO-12922.8-P) Avail: NTIS HC A02/MF A01 CSCL 20/2

Using molecular dynamics, a study was made of the transport of energy in perfect, crystalline solids subjected to heating and to mechanical compression. Two aspects were emphasized in the approach to these problems, (1) careful evaluation of the validity of the model and (2) detailed analyses of the mechanisms of energy transport and energy sharing. This report summarizes the results of the study. The conclusion reached indicates that many features related to the transport of energy in the model are indeed realistic and therefore it is of interest to study the mechanisms involved with a view to gaining a more detailed understanding of the process of energy sharing and of approach to equilibrium. Author (GRA)

N79-14910# Advanced Research and Applications Corp., Sunnyvale, Calif.
SOLID-SOLID REACTIONS IN METAL FILMS ON SILICON Final Report, 1 May 1977 - 30 Apr. 1978
T. J. Magee and J. Peng 14 Sep. 1978 50 p refs
(Contract DAAG29-77-C-0024)
(AD-A060100; ARACOR-FR-78-P6; ARO-14931.3-MS) Avail: NTIS HC A03/MF A01 CSCL 11/6

Investigations were conducted on solid-solid reactions in gold and aluminum thin films formed on Si substrates at deposition temperatures below the eutectic points. Additional research was also performed on the reactions between Al thin films and polycrystalline (CVD) Si. As-deposited and annealed structures were studied using correlated data from transmission electron microscopy/diffraction (TEM/TED), Auger electron spectroscopy (AES) profiling, and forward current-voltage (I-V) measurements. GRA

N79-14911# Stanford Univ., Calif. Edward L. Ginzton Lab.
ELECTRONIC STRUCTURE OF TRANSITION METAL COMPOUNDS Final Report, 1 May 1973 - 30 Sep. 1978
W. A. Harrison Sep. 1978 19 p refs
(Contracts DAAG29-73-C-0024; DAAG29-77-C-0022)
(AD-A060329; GL-2858; ARO-10995.3-MC) Avail: NTIS HC A02/MF A01 CSCL 20/10

The initial effort was to seek the origin of crystal structure determination by studies of terms in the energy of higher order than second in the pseudopotential. This study suggested the determining role of d-states and therefore led to studies of transition metals and, in the final year, to a concentration on transition-metal compounds. This report discusses the evolution and the problems addressed. The final section describes the principal findings, each topic being summarized by a paragraph on the status of that problem. The completed parts of the program have been published in the series of papers listed in the report. GRA

N79-14912# North Texas State Univ., Denton. Dept. of Physics.
OPTICALLY INDUCED HOT ELECTRON EFFECTS IN SEMICONDUCTORS Summary Report, 1 Sep. 1976 - 31 Aug. 1978
Arthur L. Smirl 31 Aug. 1978 96 p refs
(Contract N00014-76-C-1077)
(AD-A060310) Avail: NTIS HC A05/MF A01 CSCL 20/12

Progress is reported in using the high electric fields and ultrashort pulses from mode-locked lasers to study the temporal evolution of the saturable optical properties of semiconductors on a picosecond time scale. In these studies, the excite and probe technique is employed to obtain information concerning the ultrafast dynamics of photogenerated electron-hole plasmas. Germanium has been chosen for the initial investigations since its bandgap energy is comparable to but less than the photon energy of the Nd's glass laser. GRA

N79-14913# Georgia Inst. of Tech., Atlanta. Applied Sciences Lab.
STUDIES OF SOLID STATE REACTIONS ON ELEMENTAL AND COMPOUND SEMICONDUCTOR SURFACES Final Report, 1 May 1975 - 30 Apr. 1978
Edwin J. Scheibner 31 Jul. 1978 146 p refs
(Contract N00014-75-C-0909)
(AD-A059920) Avail: NTIS HC A07/MF A01 CSCL 20/12

The results of investigations on the solid state reactions which occur at the various interfaces in thin composite structures on the elemental and compound semiconductors, silicon and gallium arsenide, are reported. Free energies derived from bulk thermodynamic data predict the direction of oxidation-reduction reactions at interfaces. The identification of the resulting solid state phases used high energy resolution Auger electron spectroscopy (AES) and X-ray photoelectron spectroscopy (XPS) techniques and the chemical shifts in energy associated with Auger or photoelectron peaks when an element is oxidized.

Experimental MOS and Schottky barrier test structures were fabricated to correlate the chemical data and other interface characteristics with electrical measurements. Theoretical interpretation of data from high energy resolution AES and XPS studies of thin films on aluminum gave a value for the attenuation length of approx. 1400 eV electrons in Al2O3 and information on various electron scattering mechanisms. A review of GaAs passivation is made and a method based upon interface reactions is suggested. GRA

N79-14914# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Electrical Engineering.
INVESTIGATION ON CHALCOPYRITE SEMICONDUCTORS Final Report, 1 Oct. 1976 - 1 May 1978
George B. Wright 15 May 1978 5 p
(Contract N00014-76-C-0384)
(AD-A059841) Avail: NTIS HC A02/MF A01 CSCL 20/12

A rigid ion second neighbor force constant phonon model was developed for chalcopyrites with zincblende parent compound as a limiting case. Study of zincblende to chalcopyrite mappings led to development of a Brillouin zone special point summation theory. Brout's sum rule was shown to be a limiting case of this theory. The importance of the relation between zincblende and chalcopyrite phonon deformation parameters led to development of a phenomenological model for zincblende phonon deformation model valid throughout the Brillouin zone. The techniques developed for generating this model are simpler than others published to date and are applicable to any symmetry based model. Author (GRA)

N79-14915# Institut fuer Physikalische Weltraumforshung, Freiburg (West Germany).
DYNAMIC PROPERTIES OF INTERFACE STATES IN MOS-STRUCTURES Final Technical Report, 1 Jan. 1977 - 31 Dec. 1977
A. Goetzberger, E. Klausmann, and M. J. Schulz Apr. 1978 35 p refs
(Grant DA-ERO-77-G-020; DA Proj. 1T1-61102-BH-57)
(AD-A059494) Avail: NTIS HC A03/MF A01 CSCL 20/12

The dynamic properties of impurities implanted into the interface of MOS structures are investigated. Interface state density, trapping time constants and capture cross sections are measured. Capacitance and conductance measurement techniques are used. Special consideration is placed on the DLTS (Deep Level Transient Spectroscopy) -method. This method was applied to MOS structures for the first time. The interface state density of implanted MOST structures shows a continuous distribution versus energy. The increase to the band edge is steeper and more distinct in implanted structures than in clean (non-implanted) samples. The capture cross section drops towards the band edge independent of the implanted species. Its magnitude is always of the same order as in clean samples. Influences of radiation damage can clearly be observed and separated from the continuous interface state spectrum. Author (GRA)

N79-14916# National Technical Information Service, Springfield, Va.
SQUID DEVICES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Sep. 1978
George W. Reimherr Nov. 1978 103 p Supersedes NTIS/PS-77/1046; NTIS/PS-76/0872; NTIS/PS-75/687
(NTIS/PS-78/1169/8; NTIS/PS-77/1046; NTIS/PS-76/0872; NTIS/PS-75/687) Avail: NTIS HC $28.00/MF $28.00 CSCL 20L

The cited reports discuss the theory, performance, preparation, and applications of superconducting quantum interference devices (SQUID). This updated bibliography contains 98 abstracts, 11 of which are new entries to the previous edition. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N79-14917# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
SHTP-E, A COMPUTER IMPLEMENTATION OF THE FINITE-DIFFERENCE EMBEDDING METHOD OF ABLATION ANALYSIS
J. D. Randall May 1978 92 p refs
(APL/JHU-CP-067) Avail: NTIS HC A05/MF A01

PL/1 procedures were developed that use finite difference techniques to analyze ablation problems by embedding them in inverse heat conduction problems with no moving boundaries. The procedures which form a set of subroutines that can be called from a problem-oriented main program written by the user, include provisions for one-, two-, or three-dimensional conduction, parallel modes of heat transfer, thermal contact, choices of implicit and explicit difference techniques, temperature dependent and directional thermal properties, radiation relief, aerodynamic heating, chemical ablation, and material removal from combinations of flat, cylindrical, and spherical surfaces. Debugging aids and external identifiers, a directory of computer libraries pertaining to the PL/1 procedures, and an illustrative problem are included. A.R.H.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N79-14918# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
DEVELOPMENT OF AN AIR FORCE FACILITIES ENERGY INFORMATION SYSTEM M.S. Thesis
David F. Manchester and Ronald L. Schuldt Jun. 1978 156 p refs
(AD-A059309; AFIT-LSSR-8-78A) Avail: NTIS HC A08/MF A01 CSCL 05/2

There is some doubt about whether or not Air Force Civil Engineering personnel, who are responsible for the planning, construction, operation, and maintenance of all Air Force facilities, have the proper background information to cope with the current energy crisis. This thesis analyzes the results of a survey of over 500 Civil Engineering officers and equivalent civilians on the subject of energy information. The analysis shows that, in spite of the recent interest in energy, very few managers feel that they have enough background information to make educated decisions about energy problems in their functional areas. Seventy-seven percent of the respondents feel that Civil Engineering needs an energy background information system. Based on questionnaire responses, readings, and interviews, the requirements for such a system are discussed. Sources of energy information which should be incorporated into an Air Force Energy Information System are described. The system could be established during the current headquarters reorganization. Author (GRA)

N79-14919# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

THE APPLICATION OF SYSTEM DYNAMICS TO A MANAGERIAL MODEL OF AERONAUTICAL SYSTEMS DIVISION M.S. Thesis

Jerry L. Elder and Michael B. Nixon Jun. 1978 120 p refs
(AD-A059312; AFIT-LSSR-22-78A) Avail: NTIS HC A06/MF A01 CSCL 05/1

Models presently available to Air Force managers are restricted in their use to particular functional areas, e.g., manpower and cost-estimating models. Extensive research has indicated that useful and comprehensive managerial models of large, complex military organizations have not been developed. The purpose of this research is to develop a model of the managerial decision structure and important information, material, and fund flows which are directly relevant to ASD's mission (planning and managing the acquisition of aeronautical systems, subsystems, and associated equipment). Such a model would aid in the top level policy-making process and in understanding the system's behavior. System dynamics appears to provide a most suitable methodology for this model development. This initial effort is limited to the development of: (1) a general conceptual model of the process by which ASD's mission is now accomplished, and (2) a detailed operating model of one segment of the general model--the process of project management--providing an example of how the general model could be further developed.
Author (GRA)

N79-14920# Space and Missile Systems Organization, Los Angeles Air Force Station, Calif.

PROCEEDINGS OF INDUSTRY/SAMSO CONFERENCE AND WORKSHOP ON MISSION ASSURANCE

1978 301 p Conf. held at Los Angeles, 25-27 Apr. 1978
(AD-A059654; SAMSO-TR-78 58) Avail: NTIS HC A14/MF A01 CSCL 22/2

Partial Contents: Design considerations and responsibilities for Mission Assurance; The role of contractual incentives in Management Motivation for Mission Assurance; The role of Management and Program Review Process in Mission Assurance; Techniques for management and control of the development and application of systems computer software; Subcontractor/supplier interface and control to achieve Mission Assurance; Development and Control of microelectronics/hybrids for space application; Identification and examination of manufacturing and assurance techniques required to minimize mission risk; Optimization of testing of components, subsystems, and systems for Mission Assurance; and Industry's approach to personnel motivation and training and SAMSO/Aerospace /Industry experience sharing. GRA

N79-14921# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

A COST ANALYSIS ON PROCURING IMPROVED TECHNICAL ORDER DATA FOR THE F-15 WEAPON SYSTEM M.S. Thesis

Robert Wilmer Bennett and William D. K. Moravek Jun. 1978 152 p refs
(AD-A059571; AFIT-LSSR-27-78A) Avail: NTIS HC A08/MF A01 CSCL 01/3

The United States Air Force has expressed strong interest in finding methods of reducing weapon system maintenance cost. One method is to increase the productivity of maintenance personnel by providing better technical data. High maintenance personnel cost makes it imperative that a more efficient, improved, proceduralized TO (PTO) format be developed and utilized. Due to the inherent advantages of PTOs, the F-15 Technical Order Management Agency manager is in the process of evaluating the cost of converting the F-15 TOS to the PTO format. A cost versus benefits analysis of the advantages and disadvantages of PTOs has been accomplished to assist top level management in deciding the appropriate type TO option to procure. To accomplish the analysis this thesis identifies the steps in the TO procurement process, explains the techniques used by McDonnell-Douglas Aircraft Company to develop cost estimates for the F-15 weapon system TOs, describes the advantages of procuring the F-15 weapon system TOs in the PTO format, and estimates where possible the monetary savings derived from the advantages of the improved PTO format. This thesis concludes that the F-15 weapon system technical data should be procured in the PTO format. Author (GRA)

N79-14922# California Univ., Livermore. Lawrence Livermore Lab.

FTE: A RESOURCE-ALLOCATION PROGRAM FOR MANAGERS

Peter Keller 15 Oct. 1977 101 p
(Contract W-7405-eng-48)
(UCRL-52244) Avail: NTIS HC A06/MF A01

FTE creates charts that show quickly how time and resources are being allocated. The FTE chart is an easy-to-digest chart showing trends and relationships. It is a useful tool for the planning and communication of ideas at all levels of management in private industry and government. Although it does not replace the detailed analysis of data needed for accurate planning, it does show the overall picture. This overview must first be understood before the details can be accurately interpreted. FTE is written in LRLTRAN and runs on the CDC 7600 computers of the Livermore timesharing network. DOE

N79-14923# General Accounting Office, Washington, D. C. Procurement and Systems Acquisition Div.

FEDERALLY SPONSORED RESEARCH AT EDUCATIONAL INSTITUTIONS: A NEED FOR IMPROVED ACCOUNTABILITY

18 Aug. 1978 37 p
(PB-285770/4; PSAD-78-135) Avail: NTIS HC A03/MF A01 CSCL 05A

Educational institutions receive about $3.8 billion a year through Federal grants and contracts for the conduct of research. Under present systems and methods in use at educational institutions, the Federal Government cannot reasonably be assured that Federal funds are effectively being used for specific research objectives. Many of the problems discussed in this report are the result of the wide latitude and flexibility given to educational institutions by Federal Management Circular 73-8. Strengthening the cost principles is required since the absence of more definite guidance has resulted in varying interpretations and practices and in much disagreement between the Federal Government and educational institutions. GRA

N79-14924# General Accounting Office, Washington, D. C. Health Resources Div.

NEED FOR INCREASED EMPHASIS ON TIMELY CONTRACT AND GRANT CLOSEOUT ACTIVITIES

21 Sep. 1978 12 p
(PB-285926/2; HRD-78-142) Avail: NTIS HC A02/MF A01 CSCL 05A

In October 1975, GAO reported that the Department of Labor's Employment and Training Administration had a large backlog of expired contracts and grants which had not been closed out. That little improvement was made through March 31, 1978 in this follow up survey. Labor needs to place increased emphasis on timely closeout activities to help assure that Federal funds are fully accounted for. GRA

N79-14925# Arizona Univ., Tucson. Office of Arid Lands Studies.

FEDERAL-STATE WATER USE RELATIONS IN THE AMERICAN WEST: AN EVOLUTIONARY GUIDE TO FUTURE EQUILIBRIUM

Milton H. Jamail, John R. McCain, and Scott J. Ullery Jun. 1978 164 p
(Contract DI-14-34-0001-7819)
(PB-286309/0; Arid-Lands-Resource-IP-11; W78-11579; OWRT-W-245(7819)(1)) Avail: NTIS HC A08/MF A01 CSCL 13B

Federal-state relations in the field of water resources development in the Colorado River Basin are examined through a review of the literature. A framework is set out in which water policy development in the states of the Colorado River Basin (Arizona, Colorado, Wyoming, California, Nevada, Utah, and New Mexico) can be explained. Distributive, redistributive, and regulatory politics are defined as the three arenas in which water policy discussions take place. After this model is explained, development of water projects and policies in the Basin is explored. The authors conclude that the administration yielded on most

of its proposed reforms to avoid a repetition of the 1977 confrontation with the Congress. GRA

N79-14926# Metropolitan Washington Council of Governments, D. C.
A DEMONSTRATION OF AREAWIDE WATER RESOURCES PLANNING. USER'S MANUAL Final Report
C. S. Sponner, J. Promise, and P. H. Graham Apr. 1978 207 p refs
(Contract EPA-68-01-3704)
(PB-286205/0; EPA-600/5-78-006B) Avail: NTIS HC A10/MF A01 CSCL 13B

A demonstration of areawide water resources planning by the Metropolitan Washington, D.C. Council of Governments (MWCOG) is documented. A framework water resources planning model is a comprehensive analytical tool for use in areawide planning. The physical simulation portion was formed by linking component computer models which test alternative future community development patterns by small area, estimate water demands by usage categories, calculate sewage flows based on water demands and add infiltration/inflow simulate stormwater runoff, test application of alternative waste treatment management systems, and simulate the quality response of the region's major water body. GRA

N79-14927# New England River Basins Commission, Boston, Mass.
SCHEDULE OF PRIORITIES: 1980 - 1984. PRIORITY RECOMMENDATIONS FOR SELECTED FEDERAL WATER AND RELATED LAND RESOURCE PROGRAMS IN NEW ENGLAND
Jul. 1978 109 p
(PB-286379/3; PR-80/84) Avail: NTIS HC A06/MF A01 CSCL 13B

The New England region's priorities for federal funding of water and related land resource programs in Farecal Years 1980-1984 are presented. By evaluating and ranking the recommendations made through river basin plans and other Commission studies, and by integrating them at the regional level, the priorities report provides decision makers in federal and state resource agencies, in the Office of Management and Budget, and in Congress with a schedule of programs required to address New England's most significant resource problems. Among the priority items considered in the report are: comprehensive flood plain management; coordinated water supply and water quality management; dredging management; and water related recreation. GRA

N79-14928# American Automatic Control Council, Wickliffe, Ohio.
RESEARCH NEEDS OF THE AUTOMATION FIELD
Samuel J. Dwyer, III and Theodore J. Williams Mar. 1978 245 p refs Revised
(Grant NSF APR-76-01002)
(PB-286565/7; NSF/RA-780089; Rept-8-Rev) Avail: NTIS HC A11/MF A01 CSCL 05A

Recommended research areas include: (1) basic manufacturing systems architectures; (2) geometric modelling; (3) data base design and operation; (4) hierarchical control including resource and production scheduling; (5) software-hardware interfaces between machines and between men and machines; (6) automated diagnosis, maintenance and related techniques; (7) fault tolerant, self-repair, and self-diagnostic techniques; (8) advanced software production techniques; (9) machine 'vision' and other pattern recognition techniques; (10) transducers and smart sensors; and (11) economic analysis of automated systems. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N79-14929*# National Aeronautics and Space Administration, Washington, D. C.
RESEARCH AND TECHNOLOGY OBJECTIVES AND PLANS SUMMARY (RTOPS). RESEARCH AND TECHNOLOGY PROGRAM, FISCAL YEAR 1979
1979 142 p
(NASA-TM-80035) Avail: NTIS HC E02/MF E02 CSCL 05B

A compilation of the summary portions of each of the Research and Technology Operating Plans (RTOP) used for management review and control of research currently in progress throughout NASA is presented along with citations and abstracts of the RTOPs. Indexes include: subject; technical monitor; responsible NASA organization; and RTOP number. F.O.S.

N79-14930# University Coll., London (England). Dept. of Statistics and Computer Science.
ACCESS TO AN INFORMATION RETRIEVAL SYSTEM VIA A DISTRIBUTED COMPUTER NETWORK
Adrian V. Stokes 31 Dec. 1977 48 p refs
(AD-A059633; TR-40) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes an analysis of the access made to the National Library of Medicine databases, particularly CANCERLINE and MEDLINE, by a group of users in the UK. Author (GRA)

N79-14931# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
THE B ASTERISK TREE SEARCH ALGORITHM. A BEST-FIRST PROOF PROCEDURE Interim Report
Hans J. Berliner Apr. 1978 24 p refs
(Contract F44620-73-C-0074; ARPA Order 2466; AF Proj. 2466)
(AD-A059391; CMU-CS-78-112; AFOSR-78-1253TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

In this paper we present a new algorithm for searching trees. The algorithm, which we have named B*, finds a proof that an arc at the root of a search tree is better than any other. It does this by attempting to find both the best arc at the root and the simplest proof, in best-first fashion. This strategy determines the order of node expansion. Any node that is expanded is assigned two values: an upper (or optimistic) bound and a lower (or pessimistic) bound. During the course of a search, these bounds at a node tend to converge, producing natural termination of the search. As long as all nodal bounds in a sub-tree are valid, B* will select the best arc at the root of that sub-tree. The B* method assigns a greater responsibility for guiding the search to the evaluation functions that compute the bounds than has been done before. In this way knowledge, rather than a set of arbitrary predefined limits can be used to terminate the search itself. It is interesting to note that the evaluation functions may, measure any properties of the domain, thus resulting in selecting the arc that leads to the greatest quantity of whatever is being measured. GRA

N79-14932# Los Alamos Scientific Lab., N. Mex.
I2G: CODE FOR CONVERSION OF ISOTOPE-ORDERED CROSS-SECTION LIBRARIES INTO GROUP-ORDERED CROSS-SECTION LIBRARIES
W. M. Resnik, II 1977 30 p refs
(Contract W-7405-eng-36)
(LA-6950-MS) Avail: NTIS HC A03/MF A01

Many current reactor physics codes accept cross-section libraries in an isotope-ordered form, convert them with internal preprocessing routines to a group-ordered form, and then perform calculations using these group-ordered data. Occasionally, because of storage and time limitations, the preprocessing routines in these codes cannot convert very large multigroup isotope-ordered libraries. For this reason, the 12G code, i.e., ISOTXS to GRUPXS, was written to externally convert isotope-ordered cross section libraries in the standard file format called ISOTXS to group-ordered libraries in the standard format called GRUPXS. This code uses standardized multilevel data management routines which establish a strategy for the efficient conversion of large libraries. The 12G code is exportable contingent on access to, and an intimate familiarization with, the multilevel routines. These routines are machine dependent and therefore must be provided by the importing facility. DOE

N79-14933# Oak Ridge National Lab., Tenn.
SYSTEMS STUDY FOR INITIAL DEVELOPMENT OF A LABORATORY RECORDS INFORMATION SYSTEM
L. J. Peck and C. R. Shriner Nov. 1977 16 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6090) Avail: NTIS HC A02/MF A01

Topics covered include (1) present information division procedure for generating the Oak Ridge National Laboratory ORNL-3300; (2) problems with the existing ORNL-3300 system; (3) a proposed system for maintaining the data base; (4) foreign visitors' data base; (5) photograph data base; and (6) recommendations for system implementation. DOE

N79-14934# Boeing Computer Services Co., Falls Church, Va.
INTEGRATED SAFEGUARDS INFORMATION SYSTEM (ISIS), EXECUTIVE SUMMARY
R. H. Simonsen Jun. 1978 34 p
(Contract NRC-04-77-065)
(PB-286869/3; NUREG-CR-0328) Avail: NTIS HC A03/MF A01 CSCL 05B

Current and projected information required to safeguard nuclear materials against attack and/or sabotage was refined and the capabilities of relevant and existing safeguards information systems within both the government and the licensed nuclear industry were examined. The general design of a system developed to collect, process, and integrate safeguards-related information is described. GRA

N79-14935# Computer Horizons, Inc., Cherry Hill, N. J.
ELEVEN YEAR TRENDS IN PUBLICATION RATES FOR US ACADEMIC INSTITUTIONS Final Report, 1 Oct. 1976 - 1 Jun. 1978
Paul R. McAllister and Francis Narin 1 Jun. 1978 84 p refs
(Contract NSF PRM-76-81724)
(PB-285572/4; CHI-765A/060178) Avail: NTIS HC A05/MF A01 CSCL 05B

Overall trend data on research publications for 136 U.S. academic institutions in nine fields of science between 1965 and 1975 are examined. Publication data are counts of scientific papers (articles, notes and reviews) authored by scientists at the 136 institutes and published in journals covered by the Science Citation index. Eleven year trends were analyzed on a field by field basis; in terms of four research levels, from basic to applied; and with respect to publication size of the institution. GRA

N79-14936# Federal Data Processing Reorganization Project, Washington, D. C.
FEDERAL DATA PROCESSING REORGANIZATION STUDY: HUMAN RESOURCES TEAM REPORT Final Report
Robbin R. Hough (Oakland Univ.), J. Gary Augustson (DOT, Washington, D. C.), John M. Daugherty (Office of the Chief of Staff (Army), Gerald T. Hedlund (Gen. Foods Corp.), Peter B. Henault (Seattle City Lght), and David Hirschberg (Bureau of Econ. Analysis) Sep. 1978 213 p refs Sponsored by Office of Management and Budget
(PB-287174/7) Avail: NTIS HC A10/MF A01 CSCL 09B

The way in which the Federal Government acquires, manages, and uses information technology was investigated in the following agencies responsible for the delivery of human services: the Department of Health, Education and Welfare, Housing and Urban Development, Labor, and Veterans Administration. Current management of information technology is described for each agency. The extent and causes of real or perceived problems are documented and viable options are identified and analyzed as solutions to those problems. Recommendations for improvement are suggested. GRA

N79-14937# Federal Data Processing Reorganization Project, Washington, D. C.
FEDERAL DATA PROCESSING REORGANIZATION STUDY: PERSONNEL TEAM REPORT Final Report
James McManama (City of Dayton, Ohio), Ray Demarest (Civil Serv. Comm.), Israel Feldman (Dept. of Housing and Urban Develop.), Vincent Guidace (Air Force Data Serv. Center), David Skeen (Dept. of the Navy), Stephen J. Stofko (US House of Representatives), and Carol M. Vaughan (Bureau of the Census) Sep. 1978 129 p refs Sponsored by Office of Management and Budget
(PB-287175/4) Avail: NTIS HC A07/MF A01 CSCL 09B

The current management of personnel involved in federal information technology is assessed and recommendations are made for improving the way in which the Federal Government acquires, manages and uses information technology. Topics discussed include personnel development, specialized training, job analysis, and manpower utilization. GRA

N79-14938# Federal Data Processing Reorganization Project, Washington, D. C.
FEDERAL DATA PROCESSING REORGANIZATION STUDY: OPERATIONAL MANAGEMENT TEAM REPORT Final Report
Philip J. Kiviat (Federal Computer Performance Evaluation and Simulation Center), Jerry R. Berry (Tenneco, Inc.), Thomas Giammo (Social Security Admin.), and Donald A. Marchand (South Carolina Univ., Columbia) Sep. 1978 206 p refs Sponsored by Office of Management and Budget
(PB-287176/2) Avail: NTIS HC A10/MF A01 CSCL 09B

The management of information technology in federal agencies from the time a decision is made to implement a data processing supported system until its replacement or termination was investigated. Specific aspects of operational management discussed include: the systems development process; software sharing; cost accounting for data processing; installation management; confidentiality and security; evaluation and audit; and technical assistance. The earned autonomy concept which deals with the desirable balance between agency autonomy and central control and direction is examined. Recommendations are given for improving Federal management in all seven areas.GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N79-14939# Army Military Center, Alexandria, Va.
UNITED STATES RELIANCE ON IMPORTS OF MINERALS AND METALS: A CASE STUDY Final Report. M.A. Thesis - Texas Univ.
Herbert H. Worff, Jr. May 1978 147 p refs
(AD-A057681) Avail: NTIS HC A07/MF A01 CSCL 05/3

Recent events such as the Arab oil embargo and rising commodity prices have caused public concern over the continued availability of raw materials at reasonable prices. This thesis focuses on answering whether raw materials are subject to collusion among producing countries to withhold supplies or raise prices and whether there is a physical shortage of these materials. A case study of chromium, cobalt, manganese, nickel and platinum-group metals is conducted considering the political and economic aspects of mineral supplies. The results indicate that there is no physical shortage and that collusion among producing countries to raise prices or restrict supplies is not likely. Author

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N79-14940# National Science Foundation, Washington, D. C.
FEDERAL FUNDS FOR RESEARCH AND DEVELOPMENT, FISCAL YEARS 1977, 1978, AND 1979. VOLUME 27: DETAILED STATISTICAL TABLES, APPENDIX C Surveys of Science Resources Series
1978 177 p refs
(PB-285639/1; NSF-78-312) Avail: NTIS HC A09/MF A01 CSCL 05A

Data tables on R&D activities of Federal agencies for the 1977-1979 period by a number of breaks are presented. They cover research and development by agency, character of work (basic research, applied research, and development) and performer,

research by agency, performer, and field of science; basic research, applied research, and development by agency and performer; total research performed at universities and colleges by agency and field of science. They also provide data on R&D plant obligations by agency. In addition, data are provided on foreign performers and the distribution of R&D obligations by state. Historical series for major categories for the 1969-79 period are also given. GRA

N79-14941# General Accounting Office, Washington, D. C. Program Analysis Div.
PROGRESS IN IMPROVING PROGRAM AND BUDGET INFORMATION FOR CONGRESSIONAL USE Report to the Congress
29 Aug. 1978 47 p refs
(PB-285812/4; PAD-78-78) Avail: NTIS HC A03/MF A01 CSCL 05A

By laws the Comptroller General conducts a program to develop standard terms and classifications for Federal fiscal, budgetary, and program-related information; to identify congressional needs for such information; and to monitor recurring reporting requirements of the Congress and make recommendations for changes in these requirements. This annual report, required by title 8 of the Congressional Budget Act of 1974, summarizes GAO's work in these areas over this past year. GRA

N79-14942# National Commission on New Technological Uses of Copyrighted Works, Washington, D. C.
[RECOMMENDATIONS FOR CHANGES IN COPYRIGHT LAW OR PROCEDURE] Final Report
31 Jul. 1978 345 p refs
(PB-284141/9; CONTU-78-0006) Avail: NTIS HC A15/MF A01 CSCL 05B

Recommendations concerning changes in copyright law or procedure needed both to assure public access to copyrighted work used in conjunction with computer and machine duplication systems and to respect the rights of owners of copyright in such works, while considering the concerns of the general public and the consumed are presented. Recommendations on computer programs, data bases, works created by the use of computers and photocopying which were based on the three years of data collection, hearings, analysis and deliberation are given. Dissenting and concurring opinions by Commissions Heersey, Karpatkin and Nimmer and several appendices are included. GRA

N79-14943# General Accounting Office, Washington, D. C. Procurement and Systems Acquisition Div.
DEVELOPMENT OF A NATIONAL MAKE-OR-BUY STRATEGY: PROGRESS AND PROBLEMS Report to Congress
25 Sep. 1978 166 p
(PB-286384/3; PSAD-78-118) Avail: NTIS HC A08/MF A01 CSCL 05D

GAO's assessment of the executive branch's policies and programs for obtaining commercial or industrial products and services for Government use is reported. It discusses the history and evolution, the overall perceptions, the status of implementation, the major problems and influences, and the proposed changes to the current policy. GRA

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N79-14944*# Battelle Columbus Labs., Ohio.
DOCUMENTATION REQUIREMENTS FOR APPLICATIONS SYSTEMS VERIFICATION AND TRANSFER PROJECTS (ASVTs) Final Report
John T. Suchy 30 Sep. 1977 104 p refs
(Contract NASw-2800)
(NASA-TM-158025) Avail: NTIS HC A06/MF A01 CSCL 05A

NASA's Application Systems Verification and Transfer Projects (ASVTs) are deliberate efforts to facilitate the transfer of applications of NASA-developed space technology to users such as federal agencies, state and local governments, regional planning groups, public service institutions, and private industry. This study focused on the role of documentation in facilitating technology transfer both to primary users identified during project planning and to others with similar information needs. It was understood that documentation can be used effectively when it is combined with informal (primarily verbal) communication within each user community and with other formal techniques such as organized demonstrations and training programs. Documentation examples from eight ASVT projects and one potential project were examined to give scope to the investigation. G.Y.

N79-14945*# Battelle Columbus Labs., Ohio.
STUDY OF FEDERAL TECHNOLOGY TRANSFER ACTIVITIES IN AREAS OF INTEREST TO NASA OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS Final Report
J. A. Madigan and R. W. Earhart 30 Jan. 1978 140 p refs
(Contract NASw-2800)
(NASA-CR-158027; BCL-OA-TFR-78-1) Avail: NTIS HC A07/MF A01 CSCL 05A

Forty-three ongoing technology transfer programs in Federal agencies other than NASA were selected from over 200 current Federal technology transfer activities. Selection was made and specific technology transfer mechanisms utilized. Detailed information was obtained on the selected programs by reviewing published literature, and conducting telephone interviews with each program manager. Specific information collected on each program includes technology areas; user groups, mechanisms employed, duration of program, and level of effort. Twenty-four distinct mechanisms are currently employed in Federal technology transfer activities totaling $260 million per year. Typical applications of each mechanism were reviewed, and caveats on evaluating program effectiveness were discussed. A review of recent federally funded research in technology transfer to state and local governments was made utilizing the Smithsonian Science Information Exchange, and abstracts of interest to NASA were selected for further reference. Author

N79-14946# Parsons (Ralph M.) Co., Pasadena, Calif.
ENGINEERING AND ECONOMIC ANALYSIS OF WASTE TO ENERGY SYSTEMS Final Report, Apr. 1975 - Jun. 1977
E. Milton Wilson, John M. Leavens, Nathan W. Snyder, John J. Brehany, and Richard F. Whitman May 1978 460 p refs
(Contract EPA-68-02-2101)
(PB-285797/7; RMP-5495-1; EPA-600/7-78-086) Avail: NTIS HC A20/MF A01 CSCL 13B

Waste quantities and characteristics in the U.S. are reviewed and waste-to-energy conversion technology evaluated. All waste materials, exclusive of those from mining operations, are considered. The technology is reviewed under the categories of mechanical processing, biological conversion systems, thermal/chemical systems, and combustion. Important features of many operating facilities are described and detailed engineering and economic analyses of seven specific systems are presented. An analysis is also made of the technology and costs for conversion of pyrolytic off-gas to methane, methanol, and ammonia. Environmental pollution data are presented where available and the current control technology briefly reviewed. Conclusions on the conversion technology are made and research needs considered in a series of recommendations. GRA

N79-14947# Public Technology, Inc., Washington, D. C.
AN ASSESSMENT OF OZONE AND CHLORINE DIOXIDE TECHNOLOGIES FOR TREATMENT OF MUNICIPAL WATER SUPPLIES Progress Report, 20 Jun. 1976 - 20 Nov. 1977
G. Wade Miller, Rip G. Rice, C. Michael Robson, Ronald L. Scullin, Wolfgang Kuhn, and Harold Wolf Aug. 1978 588 p refs
(Grant EPA-R-804385)
(PB-285972/6; EPA-600/2-78-147) Avail: NTIS HC A25/MF A01 CSCL 13B

A review of the pertinent international technology of ozonation and chlorine dioxide usage is reported. Questionaires were mailed

to water treatment plants in the U.S., Canada, and Europe, requesting detailed data on use of ozone and/or chlorine dioxide. Site surveys were also conducted. The organic oxidation products resulting from chlorine dioxide and ozone application are covered in detail. Significant advances in the technology and engineering of water supply treatment equipment and systems are identified and discussed. The Biological Activated Carbon (BAC) process, recently discovered in Germany, is also discussed in great detail because of its potential impact on the present high cost of activated carbon treatment. GRA

N79-14948# Foster Associates, Inc., Washington, D.C.
A SURVEY ON NET RATES OF RETURN ON INNOVATIONS. VOLUME 1: INTRODUCTION AND SUMMARY Final Report
J. G. Tewksbury, M. Crandall, and W. Crane May 1978 16 p 3 Vol.
(Contract NSF C-76-22518)
(PB-284806/7) Avail: NTIS HC A02/MF A01; also available in set of 3 reports HC E08, PB-284805-SET CSCL 05A

Twenty diverse case studies of actual commercial innovations in which private rates of return (to the innovator) were compared to social rates of return (to the Nation). The 20 case studies had a median social rate of return (DCF) of 99%, and a median private rate of return of 24%, both expressed on a real basis and before tax, depreciation, and interest. Four of the cases showed a private rate of return of 10% or less, which is considered too low. The general view of this method was that it was a major step forward in understanding the innovative process, although it has several important but soluble problems in application. An important result of this project was development of the concept of social return attributable only to the innovator. GRA

N79-14949# Foster Associates, Inc., Washington, D.C.
A SURVEY ON NET RATES OF RETURN ON INNOVATIONS. VOLUME 2: SUMMARY AND ANALYSIS Final Report
J. G. Tewksbury, M. Crandall, and W. Crane May 1978 87 p ref 3 Vol.
(Contract NSF C-76-22518)
(PB-284807/5) Avail: NTIS HC A05/MF A01; also available in set of 3 reports HC E08, PB-284805-SET CSCL 05A

Information is required on how private rates of return to innovating firms compare with the benefits realized by society at large from technological innovation. To generate this information, the Division of Policy Research and Analysis has encouraged and supported research on improving and applying methods of measuring net private rates of return from innovation, and the associated net benefits to other parties in society. This project consisted of 20 case studies of actual, commercialized innovations in which the private rate of return to the innovators is compared to the social rate of return to the nation. GRA

N79-14950# Foster Associates, Inc., Washington, D.C.
A SURVEY ON NET RATES ON RETURN ON INNOVATIONS. VOLUME 3: DETAILED CASE STUDIES Final Report
J. G. Tewksbury, M. Crandall, and W. Crane May 1978 167 p 3 Vol.
(Contract NSF C-76-22518)
(PB-284808/3) Avail: NTIS HC A08/MF A01; also available in set of 3 reports HC E08, PB-284805-SET CSCL 05A

The third volume of the final report of a survey on net rates of return on innovations is presented. The volume covers 20 case studies on industrial products, consumer products, and industrial processes. GRA

N79-14951# Purdue Univ., Lafayette, Ind. Water Resources Research Center.
CALIBRATION AND SENSITIVITY ANALYSIS OF THE CONTINUOUS RUNOFF SIMULATION MODEL STORM
Jean LucSautier and Jacques W. Delleur May 1978 81 p refs
(Contract DI-14-31-001-5213; OWRT Proj. C-6106(5213)(3))
(PB-285818/1; TR-103; PWRRC-TR-103; W78-11060) Avail: NTIS HC A05/MF A01 CSCL 08H

The hourly continuous runoff simulation model STORM provide a substantial improvement over the elementary rainfall-runoff transformations. The composite runoff coefficient method is used in an urban watershed and the Soil Conservation Service method is used for the previous areas in a semi-urban watershed. A methodology is developed to calibrate the parameters characterizing the equations relating to each of these methods. A sensitivity analysis of the model is done around the calibration values of the parameters. The two methods of analysis show that the yearly total amount of runoff, the total amounts by storm events and the peaks by event are all good and stable estimates. The choice of method depends on the percent of imperviousness. GRA

N79-14952# Michigan Univ., Ann Arbor.
NITRATE REMOVAL FROM WATER SUPPLIES BY ION EXCHANGE Final Report, Aug. 1975 - Dec. 1976
Dennis A. Clifford and Walter J. Weber Jun. 1978 311 p refs
(Grant EPA-R-803898)
(PB-285275/4; EPA-600/2-78-052) Avail: NTIS HC A14/MF A01 CSCL 13B

Disposal of the spent regenerant brine solution containing nitrate is a potential problem. Two processes were examined; in the single-bed, strong-base anion exchange with NaCl regeneration and two-bed strong-acid, weak-base ion exchange with HCl and NH4OH regeneration. Both systems must be operated to nitrate breakthrough to minimize regeneration costs. The two-bed process is one and one-half to two times as expensive to build and operate as is the single-bed process, but produces softened low-TDS, low-nitrate water, and has a readily disposable, spent regenerant with fertilizer value. Important design considerations were found to include the nitrate and sulfate concentrations in the raw water, the service flow rate, the resin bed depth, and the nitrate-chloride selectivity of the resin. GRA

N79-14953# Culp/Wesner/Culp, Santa Aha, Calif.
ESTIMATING COSTS FOR WATER TREATMENT AS A FUNCTION OF SIZE AND TREATMENT EFFICIENCY Interim Report, Oct. 1977 - Jun. 1978
Robert C. Gumerman, Russell L. Culp, and Sigurd P. Hansen Aug. 1978 297 p
(Contract EPA-68-03-2516)
(PB-285274/7; EPA-600/2-78-182) Avail: NTIS HC A13/MF A01 CSCL 13B

Unit processes and combinations of unit processes which are capable of removing contaminants included in the National Interim Primary Drinking Water Standards are discussed. Construction, operation, and maintenance cost curves are presented for 30 unit processes, which are considered to be especially applicable to contaminant removal. All costs are presented in terms of January 1978 dollars, but a discussion is included on cost updating. For construction cost, either of two methods may be used. One is to use indices which are specific in the eight categories used to determine construction cost. The second is use of an all-encompassing index, such as ENR Construction Cost index. Operation and maintenance requirements may be readily updated or adjusted to local conditions, since labor requirements are expressed in hours per year, and electrical requirements in kilowatt-hours per year. GRA

N79-14954# National Conference of State Legislatures, Denver, Colo. Office of Science and Technology.
AN ASSESSMENT OF SCIENCE AND TECHNOLOGY IN STATE LEGISLATURES
Joanna Mack Jul. 1978 46 p Sponsored in part by NSF
(PB-285785/2; NSF/RA-780256) Avail: NTIS HC A03/MF A01 CSCL 05A

State legislative capacity for handling the scientific and technical aspects of policy issues was studied. Types of legislative science and technology, staff, and the functions of such staff within existing legislative structures, are defined. Outside assistance sources are explored, and recommendations for Federal action to encourage state science and technology capacity building are made. State legislatures should promote the development of internal capabilities to define their science and technology problems and to form stable links with outside resources. Outside providers of science and technology information should be encouraged to develop internal liaison capabilities and to follow legislative information. GRA

N79-14955# Culp/Wesner/Culp Clean Water Consultants, El Dorado Hill, Calif.

EFFECTS OF THERMAL TREATMENT OF SLUDGE ON MUNICIPAL WASTEWATER TREATMENT COSTS Final Report

Lewis J. Ewing, Jr., Howard H. Almgren, and Russell L. Culp Jun. 1978 120 p refs

(Contract EPA-68-03-2186)

(PB-285707/6; EPA-600/2-78-073) Avail: NTIS HC A07/MF A01 CSCL 13B

Data for estimating average construction costs and operation and maintenance requirements are presented for thermal treatment of municipal wastewater sludges; for handling, treatment, and disposal of the strong liquor generated; and for controlling odors produced. Size ranges covered are treatment plants of 1 to 100 mgd, and sludge handling facilities of 1 to 100 tons per day. Estimating data are included for many separate process functions associated with thermal treatment of sludge, processing of the sidestreams, and control of odors produced. Where possible, cost components are presented in a manner which will allow adjustment to fluctuating costs for labor, materials, and energy. GRA

N79-14956# Multisystems, Inc., Cambridge, Mass.

MODELING DEMAND-RESPONSIVE FEEDER SYSTEMS IN THE UTPS (URBAN TRANSPORTATION PLANNING SYSTEM) FRAMEWORK Final Report, Apr. 1977 - Jan. 1978

H. R. Menhard and M. Flusberg Jul. 1978 168 p refs Prepared for Cambridge Systematics, Inc., Mass.

(Contract DOT-TSC-977)

(PB-285763/9; DOT-TSC-UMTA-78-23; UMTA-MA-06-0049-78-9) Avail: NTIS HC A08/MF A01 CSCL 13B

A methodology for incorporating DRT feeder systems in transit network analysis is reported. The focus is on the use of DRT systems to provide feeder services to fixed transit routes in low density areas. A set of previously developed DRT supply models, representing many-to-many service, many-to-one cycled service, and many-to-one subscription service has been refined for the purposes of this report. These services are discussed and general guidelines for designing feeder services offered. GRA

N79-14957# Metropolitan Sanitary District of Greater Chicago, Ill.

RECLAMATION OF A LANDFILL WITH DIGESTED SEWAGE SLUDGE Final Report

Raymond R. Rimkus, Robert O. Carlson, and Donald B. Wunderlich Aug. 1978 62 p refs

(Grant EPA-11010-DPW)

(PB-286118/5; EPA-600/2-78-120) Avail: NTIS HC A04/MF A01 CSCL 13B

The scope of the project included developing a pipeline system to transport liquid fertilizer to the application site, determining yields, analyzing plant tissue of the crops grown, observing the soil changes effected by the liquid fertilizer application, and monitoring the ground and surface water of the application site. The pipeline was built and transported liquid fertilizer from the lagoons to the application site. The application of liquid fertilizer increased the yields of wheat and corn, increased the concentration of plant nutrients in the plant tissue, and effected organic improvements in the soil. Analysis of the leachate from the piezometers showed that groundwater constituents fluctuated, partly because surface water seeped through the perforations in the piezometers at the soil surface. This pollution did not reach the groundwater aquifer sampled from a deep well constructed of solid wall pipe. GRA

N79-14958# Portland State Univ., Oreg. Systems Science Ph.D. Program.

THE USE OF STRUCTURAL MODELING FOR TECHNOLOGY ASSESSMENT, VOLUME 1

Harold A. Linstone Feb. 1978 175 p refs 2 Vol.

(Grant NSF ERS-76-21040)

(PB-285997/3; Rept-78-1-Vol-1; NSF/RA 780236) Avail: NTIS HC A08/MF A01 CSCL 05A

A survey of structural modeling literature identifies methods which might be classified as structural modeling techniques and seem potentially useful in technology assessment. Seven computer-oriented tools are tested in considerable detail. Three other important approaches which may or may not be included formally in structural modelling are also studied: tools to aid in generating elements, a misfit variable concept, and cross-impact analysis. The human role in structural modeling is clarified by stressing that much effective analysis can be executed without computer assistance by applying the tool techniques. GRA

N79-14959# Portland State Univ., Oreg. Systems Science Ph.D. Program.

THE USE OF STRUCTURAL MODELING FOR TECHNOLOGY ASSESSMENT, VOLUME 2

Harold A. Linstone Feb. 1978 448 p refs 2 Vol.

(Grant NSF ERS-76-21040)

(PB-285998/1; Rept-78-1-Vol-2; NSF/RA-780237) Avail: NTIS HC A19/MF A01 CSCL 05A

Volume One of this report defined a structural model as one which represents a system as a set of elements with pairwise relations linking some or all of the elements and is graphically represented. Volume Two is concerned with the generation and testing of these elements. In building a model to represent a given problem context, certain variables and/or interactions are represented or left out, depending upon the subjective bias of the groups involved. Methods, developed by the study team for stimulating groups in their generation of ideas and elements during the various aspects of the technology assessment process, are classified as generating tools. Twenty-one methods are included in this class and each is categorized and discussed. GRA

N79-14960# Booz-Allen and Hamilton, Inc., Philadelphia, Pa.

SEPTA MANAGEMENT STUDY Final Report

May 1978 72 p refs Sponsored by Southeastern Pennsylvania Transportation Authority, UMTA, and Delaware Valley Regional Planning Commission Prepared in Cooperation with Price Waterhouse and Co., Philadelphia, Pa.

(PB-285010/5; UMTA-PA-09-0039-78-1) Avail: NTIS HC A04/MF A01 CSCL 13B

The SEPTA Management Study was commissioned by SEPTA's funding governments to evaluate how well this mission was being performed in consideration of the agency's budget constraints, and to make specific improvement recommendations. A series of diagnostics (peer group comparison, case studies, flow charts, and organizational analysis) to identify areas where SEPTA performance appeared unusual were studied. Serious deficiencies are identified in nine functional areas (Cash Handling, ConRail Purchase-of-Service Agreement, Surface Transit Operations Planning, Vehicle Utilization, Surface Transit Maintenance, Capital Project Management, and Regional Fare Integration) and seven additional improvement areas. The roles of the SEPTA Board and SEPTA's funding agencies are discussed. Specific actions, including organizational changes, are recommended which will yield near-term benefits.

N79-14961# Massachusetts Univ., Amherst. Water Resources Research Center.

WASTEWATER MANAGEMENT PLANNING: SOURCES OF CONFLICT IN THE EVALUATION OF ALTERNATIVES

Harry E. Schwarz and Bradford M. Stern Dec. 1977 113 p refs Prepared in cooperation with Clark Univ., Worcester, Mass.

(Contract DI-14-34-0001-7046)

(PB-286001/3; PUB-91) Avail: NTIS HC A06/MF A01 CSCL 13B

The conflict between 'structural' and 'non-structural' solutions to wastewater problems were investigated. Interviews, questionnaires and secondary materials, e.g., reports, correspondence and policy papers were used to assess the problem in two study areas, the towns of Acton and Westminster. In addition to town officials and citizens, state and federal officials dealing with wastewater problems in general and the study areas in particular were interviewed, as were engineers and planners familiar with the problem. It was found: (1) that the conflict was rather between the traditional and centralized wastewater management alternatives, i.e., sewers and end-of-pipe treatment, and alternatives to that approach than between structural and non-structural measures; (2) that this conflict could exist within a town as

well as between different levels of government; (3) and that the roots of conflict often lay in areas only indirectly related to wastewater management alternatives. GRA

N79-14962# Argonne National Lab., Ill. Energy and Environmental Systems Div.

TRACE ORGANICS VARIATION ACROSS THE WASTEWATER TREATMENT SYSTEM OF A CLASS-B REFINERY

L. A. Raphaelian Jun. 1978 178 p refs

(Contract EPA-IAG-D5-0681)

(PB-285596/3; ANL/WR-78-2; EPA-600/7-78-125) Avail: NTIS HC A09/MF A01 CSCL 13B

The results of research to evaluate the efficiency of pilot-scale granular activated carbon for the removal of organic compounds refractory to the activated-sludge treatment system of a Class B petroleum refinery that met BPT best practicable technology in 1977 are presented. GRA

N79-14963# SCS Engineers, Long Beach, Calif.

ENVIRONMENTAL ASSESSMENT OF SUBSURFACE DISPOSAL OF MUNICIPAL WASTEWATER TREATMENT SLUDGE

R. J. Lofy, H. T. Phung, R. Stearns, and J. Walsh Jun. 1978 380 p refs

(Contract EPA-68-01-4166)

(PB-285609/4; EPA-530/SW-167C) Avail: NTIS HC A17/MF A01 CSCL 13B

An assessment of groundwater quality in the vicinity of eight landfill sites accepting various quantities of municipal sewage sludge was performed. An appraisal was also made of the operations and economics at each location. The study consisted of two phases. The first included a preliminary assessment of the environmental impacts of sewage sludge burial practices at the eight sites. In the second phase, additional data on leachate and groundwater quality trends over a 12-month period were obtained. GRA

N79-14964# Texas A&M Univ., College Station. Dept. of Soil and Crop Sciences.

SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICAL AND MICROBIOLOGICAL IMPLICATIONS. VOLUME 1: CHEMICAL IMPLICATIONS Final Report, 1975-1977

L. R. Hossner, Chun-Wei Kao, R. W. Weaver, and J. A. Waggoner Jun. 1978 133 p refs 2 Vol.

(Grant EPA-R-803281)

(PB-285857/9; EPA-600/2-78-131a) Avail: NTIS HC A07/MF A01 CSCL 02C

The impact of 18 years of sewage effluent irrigation on the soil and on water quality was studied. The volume of sewage arriving at the sewage treatment plant ranged from 0.219 to 0.351 cu m/sec, and contributed from 3.4 to 31.2 percent of the total flow of the bordering Concho River in 1976. The fate of applied nitrogen, phosphorus, and selected heavy metals in the soil-water-plant ecosystem were examined. Phosphorus accumulated in the soil profile to depths of 200 cm along with a slight build-up of certain heavy metals in the surface soils. Deep wells appeared to be uncontaminated by the sewage farm operation. GRA

N79-14965# Texas A&M Univ., College Station. Dept. of Soil and Crop Sciences.

SEWAGE DISPOSAL ON AGRICULTURAL SOILS: CHEMICALS AND MICROBIOLOGICAL IMPLICATIONS. VOLUME 2. MICROBIOLOGICAL IMPLICATIONS Final Report, 1975-1977

R. W. Weaver, N. O. Dronen, B. G. Foster, F. C. Heck, and R. C. Fehrmann Jun. 1978 109 p refs 2 Vol.

(Grant EPA-R-803281)

(PB-285858/7; EPA-600/2-78-131b) Avail: NTIS HC A06/MF A01 CSCL 02C

The city of San Angelo, Texas, has been using agricultural land for decades as a means of disposing of all of its municipal sewage after primary treatment. Water applications have been high enough to satisfy crop requirements for a 600 ha farm even though the farm consists of only 259 ha. The farm routinely supports about 500 cattle on its pastures and produces both row and hay crops. Public health implications of the land application of sewage were evaluated by monitoring the soils and waters on the farm to determine the incidence of Salmonella and parasites. The unusually high population of animal parasites in the soils as compared to off-farm control soils is thought to be due to the higher animal density, the vegetative cover, and relatively moist soil conditions on the farm. GRA

N79-14966# California State Office of Planning and Research, Sacramento.

AN URBAN STRATEGY FOR CALIFORNIA. ENVIRONMENTAL GOALS AND POLICY REPORT, 1978

1978 43 p

(PB-286287/8) Avail: NTIS HC A03/MF A01 CSCL 13B

Government actions which can be taken to revitalize California's urban areas, both cities and suburbs are identified. Positive steps are recommended to provide for necessary new development and protection of the state's natural environment. Although the principal focus is on issues involving the use of land, other aspects of urban life are also discussed. Proper land use can stimulate construction of adequate housing, encourage job-producing commercial and industrial growth, save energy and reduce the need for new power plants and provide for a reduction in pollution. Other urban needs, including adequate law enforcement, good schools, accessible recreational and cultural activities and efficient government must also be encouraged. GRA

N79-14967# Michigan State Univ., East Lansing. Inst. of Water Research.

A MASS BALANCE STUDY OF RECYCLING SECONDARY MUNICIPAL WASTEWATER ON ABANDONED FIELD ECOSYSTEMS Completion Report

Thomas M. Burton Jul. 1978 57 p refs

(Contract DI-14-31-0001-6023; OWRT Proj. A-091-MICH(1))

(PB-286275/3; W78-11577) Avail: NTIS HC A04/MF A01 CSCL 13B

A municipal wastewater land application system at a 10-year old oldfield site is discussed. The oldfield was very effective at wastewater renovation at all levels of irrigation and for all harvest treatments through most of the growing season. Nitrate-N concentrations in soil water leaching past the 120 cm depth remained well below the 10 mg/l drinking water standard except during September and October on the unharvested plots. Phosphorus remained at background levels on all plots at the 120 cm depth. The irrigated harvested plots were dominated by quack grass while the unharvested, irrigated plots were dominated by goldenrod. Vegetation response and plant species interactions are discussed. GRA

N79-14968# Alaska Univ., College. Inst. of Water Resources.

COLD-CLIMATE WATER/WASTEWATER TRANSPORTATION AND TREATMENT, A BIBLIOGRAPHY Completion Report

Timothy Tilsworth, Daniel W. Smith, G. M. Zemansky, and Stanley R. Justice Dec. 1977 138 p

(Contract DI-14-31-0001-5002; OWRT Proj. A-47-ALAS(1))

(PB-286258/9) Avail: NTIS HC A07/MF A01 CSCL 13B

This bibliography contains 1,400 citations, including published papers, on cold-climate water and wastewater transportation and treatment systems. Causes of the failure of Alaskan-water and wastewater treatment and transportation facilities are covered as well as methods for design improvements. GRA

N79-14969# Illinois Univ., Urbana-Champaign. Water Resources Center.

RESEARCH NEEDS RELATING TO WATER/LAND PROBLEMS IN URBANIZING AREAS

Jun. 1978 89 p refs Presented at Proc. of the Ann. Meeting of the Water Resources Center, Urbana-Champaign, Ill., 16 May 1978 Sponsored by Dept. of Interior

(PB-286236/5; UILU-WRC-78-0008; W78-11578; OWRT-A-999-ILL(6)) Avail: NTIS HC A05/MF A01 CSCL 13B

Urbanizing areas often experience problems in obtaining an adequate supply of water treatment and distribution, and in ensuring that wastewater is adequately treated so as to protect the environment and, in some cases, to permit its reuse. These proceedings present assessments of the problems and of the

research needed to solve them as discussed by consultants and governmental agency personnel during a one-day workshop sponsored by the Water Resources Center at the University of Illinois at Urbana-Champaign. The presentations cover topics such as groundwater and surface water supplies, drainage, flood management, the quality of storm runoff water, and planning methods as these issues affect both small communities and major urban areas. GRA

N79-14970# Alaska Univ., College. Inst. of Water Resources.
ALASKA WASTEWATER TREATMENT TECHNOLOGY
Ronald A. Johnson Jan. 1978 196 p refs
(Contract DI-14-34-0001-7003)
(PB-286235/7; IWR-86; W78-11575; OWRT-A-058-ALAS(1))
Avail: NTIS HC A09/MF A01 CSCL 13B

An assessment was made of wastewater treatment technology in Alaska. Some of the larger municipalities have biological treatment plants that are meeting secondary standards. By the middle of 1976, the pipeline camps and pump stations were averaging around 92 percent BOD5 removal using mainly a combination of biological and physical-chemical treatment. Most of the industries, including the pulp mills and seafood processors, and the largest municipality, Anchorage, utilize only primary treatment. The pulp mills, however, have recently agreed to install additional treatment capacity to be in compliance with PL 92-500. Wastewater treatment is virtually nonexistent at many remote villages. However, some progress is being made in upgrading sanitation facilities in some of the villages. GRA

N79-14971# Wisconsin Univ. - Madison.
MANAGEMENT OF SMALL WASTE FLOWS Final Report, Jun. 1971 - Jun. 1977
Sep. 1978 854 p refs
(Grant EPA-R-802874)
(PB-286560/8; EPA-600/2-78-173) Avail: NTIS HC A99/MF A01 CSCL 13B

Laboratory and field investigations were evaluated to develop satisfactory methods for on-site treatment and disposal of wastewaters, regardless of the site constraints. The studies were subdivided into several categories including characterization of household and commercial wastewaters, assessment of wastewater treatment alternatives, evaluation of soils for treatment and disposal of wastewater, estimation of infiltrative capacities of soils, design and operation of alternative systems dependent upon soil design and operation of alternative systems not dependent upon soil, management of on-site disposal systems, and institutional and regulatory control of on-site systems. GRA

N79-14972# Applied Management Sciences, Inc., Silver Spring, Md.
SURVEY OF THE ATTITUDES OF INTERCITY AUTOMOBILE TRAVELERS TOWARD INTERCITY PUBLIC TRANSPORTATION Final Report, Sep. 1976 - Dec. 1977
Michael J. Puma and Pamela Barnhouse Walters Dec. 1977 242 p refs
(Contract DOT-OST-60520)
(PB-286554/1; AMS-G-101; G-101) Avail: NTIS HC A11/MF A01 CSCL 13B

A personal survey was conducted of 2167 households, based on a national probability sample used by the U.S. Bureau of the Census for the Current Population Survey. The objective was to examine four areas of intercity passenger travel: changes in overall travel occurring since 1972, the year of the last National Transportation Survey (NTS); conscious changes in travel behavior which have occurred as a result of the household's perceived response to the increased availability of gasoline since 1973, the year of the gasoline shortage; potential changes in nonbusiness intercity travel which are likely to occur due to rising gasoline prices; and, the examination of unique intercity travel submarkets in which public transportation has the greatest likelihood of diverting travelers away from the private automobile for specific travel purposes. The data which were collected are primarily perceptual, i.e., no attempt was made to measure actual travel behavior (e.g., travel logs). An attempt was made to measure the public's attitude toward various characteristics of intercity travel by bus and rail (as compared to travel by automobile) and their past (and likely future) demand for intercity travel. These data were then used to define travel submarkets using a multivariate statistical procedure called discriminant analysis; identify those features of bus/rail travel which are most highly valued by potential users of public carrier modes; and, examine the price elasticity of intercity travel across travel purposes and across population subgroups. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N79-14973*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
APPLICATION OF DIGITAL IMAGE PROCESSING TECHNIQUES TO ASTRONOMICAL IMAGERY 1978
Jean J. Lorre 1 Nov. 1978 33 p refs
(Contract NAS7-100)
(NASA-CR-157839; JPL-Pub-78-91) Avail: NTIS HC A03/MF A01 CSCL 03A

Techniques for using image processing in astronomy are identified and developed for the following: (1) geometric and radiometric decalibration of vidicon-acquired spectra, (2) automatic identification and segregation of stars from galaxies; and (3) display of multiband radio maps in compact and meaningful formats. Examples are presented of these techniques applied to a variety of objects. A.R.H.

N79-14974# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE PLATE OVERLAP TECHNIQUES
Laurence G. Taff 31 Jul. 1978 25 p refs
(Contract F19628-78-C-0002)
(AD-A059895; TN-1978-30; ESD-TR-78-247) Avail: NTIS HC A02/MF A01 CSCL 03/1

This report presents the development of the plate overlap technique originally suggested by H. Eichhorn. Included are discussions of standard coordinates, plate modeling, the plate overlap technique itself, and some computational details.
Author (GRA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N79-14975*# Old Dominion Univ. Research Foundation, Norfolk, Va.
EARTH-MOON SYSTEM: DYNAMICS AND PARAMETER ESTIMATION Final Report, 17 Feb. 1975 - 31 Jan. 1979
W. J. Jr. Breedlove Jan. 1979 67 p refs
(Grant NsG-1152)
(NASA-CR-158021) Avail: NTIS HC A04/MF A01 CSCL 03B

The following topics are discussed: (1) the Unified Model of Lunar Translation/Rotation (UMLTR); (2) the effect of figure-figure interactions on lunar physical librations; (3) the effect of translational-rotational coupling on the lunar orbit; and(4) an error analysis for estimating lunar inertias from LURE (Lunar Laser Ranging Experiment) data. G.Y.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N79-14976*# Old Dominion Univ. Research Foundation, Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
SIGNIFICANCE OF RADIATION MODELS IN INVESTIGATING THE FLOW PHENOMENA AROUND A JOVIAN ENTRY BODY Final Report, 1 Jan. 1977 - 31 Mar. 1978
S. N. Tiwari and S. V. Subramanian Oct. 1978 54 p refs
(Contract NAS1-14193)
(NASA-CR-158972) Avail: NTIS HC A04/MF A01 CSCL 03B

Formulation is presented to demonstrate the significance of a simplified radiation model in investigating the flow phenomena in the viscous radiating shock layer of a Jovian entry body. The body configurations used are a 55 degree sphere cone and 50 degree hyperboloid. A nongray absorption model for hydrogen-helium gas is developed which consists of 30 steps over the spectral range of 0 to 20 eV. By employing this model, results were obtained for temperature, pressure, density, the shock layer and along the body surface. These are compared with results of two sophisticated radiative transport models available in the literature. G.Y.

N79-14977*# Chicago Univ., Ill. Dept. of the Geophysical Sciences.
ESTIMATION OF VENUS WIND VELOCITIES FROM HIGH-RESOLUTION INFRARED SPECTRA Ph.D. Thesis
Mary Ann Hrivnak Smith Dec. 1978 130 p refs
(Grant NGR-14-001-194)
(NASA-CR-158019) Avail: NTIS HC A07/MF A01 CSCL 03B

Zonal velocity profiles in the Venus atmosphere above the clouds were estimated from measured asymmetries of HCl and HF infrared absorption lines in high-resolution Fourier interferometer spectra of the planet. These asymmetries are caused by both pressure-induced shifts in the positions of the hydrogen-halide lines perturbed by CO2 and Doppler shifts due to atmospheric motions. Particularly in the case of the HCl 2-0 band, the effects of the two types of line shifts can be easily isolated, making it possible to estimate a profile of average Venus equatorial zonal velocity as a function of pressure in the region roughly 60 to 70 km above the surface of the planet. The mean profiles obtained show strong vertical shear in the Venus zonal winds near the cloud-top level, and both the magnitude and direction of winds at all levels in this region appear to vary greatly with longitude relative to the sub-solar point. G.G.

N79-14978*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ATMOSPHERIC ENTRY AND FRAGMENTATION OF DENSE METEOROIDS
T. Dale Bess Jan. 1979 37 p refs
(NASA-TP-1333; L-12508) Avail: NTIS HC A03/MF A01 CSCL 03B

Fragmentation characteristics for four artificial meteoroids of high density and high tensile strength with varying size, velocity, and material are investigated. The meteoroids analyzed were lifted to natural meteor altitude by a rocket vehicle system. The meteoroids were then accelerated back into the Earth's atmosphere at natural meteor velocities. Anomalous deceleration of high density meteors was studied. It is shown that anomalies in the deceleration are due to progressive fragmentation of the meteoroids. These anomalies in the deceleration of high density meteoroids are similar to the anomalies that occur in the deceleration of natural meteors, which are generally assumed to be porous and of weak structure. J.M.S.

N79-14979*# Stanford Univ., Calif. Center for Radar Astronomy.
RADAR STUDIES OF THE MARTIAN SURFACE Final Report
Richard A. Simpson Jan. 1979 22 p
(Grant NsG-7395)
(NASA-CR-158002) Avail: NTIS HC A02/MF A01 CSCL 03B

The acquisition, processing, and interpretation of radar from Mars are reported with emphasis on the facilities of the Arecibo observatory. The project is now essentially complete. Results include scattering law studies in the Syrtis Major, Elysium, and Chryse areas of that planet and reflectivity measurements. Software for general use in the radar program at Arecibo was developed. Participation in acquisition and reduction of data from Venus and Mercury is detailed. G.G.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N79-14980# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 407, JULY 1978. PART 1: PROMPT REPORTS. DATA FOR JUNE 1978, MAY 1978
Helen E. Coffey Jul. 1978 173 p
(PB-286733/1; SGD-407-Pt-1; NOAA-78081802) Avail: NTIS HC A08/MF A01 CSCL 03B

Data for June 1978 are reported on: alert period, daily solar indices, solar flares, solar radio waves, solar X-ray radiation, solar wind measurements, coronal holes, inferred IP magnetic field polarities, mean solar magnetic field, and Boulder geomagnetic substorm log. Data for May 1978 are provided on: daily solar activity center, sudden ionospheric disturbances, solar X-ray radiation, solar radio waves, cosmic rays, geomagnetic indices, and radio propagation indices. GRA

N79-14981# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 407, JULY 1978. PART 2: COMPREHENSIVE REPORTS. DATA FOR JANUARY 1978 - DECEMBER 1977 AND MISCELLANEA
Helen E. Coffey Jul. 1978 74 p
(PB-286734/9; SGD-407-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 03B

Data are reported on: active regions, synoptic solar maps, solar flares, solar radio waves, energetic solar particles and plasma, synoptic chart, abbreviated calendar record, regional flare index, solar radio waves, and cosmic rays are reported. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N79-14982# Emmanuel Coll., Boston, Mass.
CALCULATION OF GENERALIZED GEOMETRIC FACTOR FOR PROTON-ALPHA PARTICLE TELESCOPE AND LOW-ENERGY PROTON SPECTROMETER
Poh Shien Young, Robert Vesprini, Ernest Holeman, Thomas Spencer, and M. Patricia Hagan Jun. 1977 27 p refs
(Contract F19628-73-C-0190)
(AD-A059304; AFGL-TR-78-0137; SR-4) Avail: NTIS HC A03/MF A01 CSCL 03/2

The generalized geometric factor G(n, lambda) for the P-alpha particle telescope and LEPS instruments has been defined and formulated as an integral. Computer programs have been devised to evaluate this integral numerically assuming a sin(n) theta-type local pitch angle distribution. The results are presented graphically and in tabular form. Author (GRA)

99 GENERAL

N79-14983# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: PHYSICAL SCIENCES AND TECHNOLOGY, NO. 58

16 Jan. 1979 87 p refs Transl. into ENGLISH from various Russian journals

(JPRS-72625) Copyright. Avail: NTIS HC A05/MF A01

Papers are presented on the following topics: (1) cybernetics, computers and automation technology; (2) electronics and electrical engineering; (3) geophysics, astronomy and space; and (4) scientist and scientific organizations. Also a list of publications is presented. For individual titles, see N79-14984 through N79-14993.

N79-14984# Joint Publications Research Service, Arlington, Va.

THE 1978 STATE PRIZE AWARDED FOR PATTERN RECOGNITION WORK **c63**

S. Ilicheva *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 1-3 Transl. into ENGLISH from Sov. Latviya (Riga), 23 Nov. 1978 4 p (For primary document see N79-14983 05-99)

Copyright. Avail: NTIS HC A05/MF A01

The scientist who engineered the development of a video system connected to an electronic computer is cited. By using a photographic camera the video-computer system can fix an instant, analyze it and store the information in its memory or look into the microscopic world and display it on its television screen or printer. A brief history of the developments which lead up to the engineering of such a video-computer system is presented. For their accomplishment the scientist involved in the project was awarded the 1978 State Prize. G.Y.

N79-14985# Joint Publications Research Service, Arlington, Va.

EXHIBIT FEATURES LATEST ADVANCES IN AUTOMATED CONTROL SYSTEMS **c63**

S. B. Abramov *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 4-11 Transl. into ENGLISH from Pribory i Sistemy Upr. (Moscow), no. 11, 1978 p 54-56 (For primary document see N79-14983 05-99)

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In May-August 1978 an exhibit was opened at the Computer Technology Pavilion of the Exhibition of the Achievements of the USSR National Economy. The exhibit featured the latest advances in the development and introduction of automated control systems. One such control system, ASU-Pribor 3 System (Pribor = instrument) was introduced. The ASU-Pribor 3 System is an integrated control system for the instrument making section, designed to raise production efficiency by improving all elements of the control system using computer technology. The operational and computer system set up for the ASU-Pribor 3 System in industrial production is discussed. G.Y.

N79-14986# Joint Publications Research Service, Arlington, Va.

NEW LOGIC DETECTOR FOR TESTING MICROCIRCUITS DESCRIBED **c33**

N. I. Golovan and V. F. Litvinenko *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 12-13 Transl. into ENGLISH from Pribory i Sistemy Upr. (Moscow), no. 11, 1978 39 p (For primary document see N79-14983 05-99)

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A logic detector designed to check for defects during the adjustment and repair of various units of the ASVT-M (Aggregate System of Computer Equipment-M) built on the basis of series 155 and 131 integrated microcircuits is described. The logic detector is a counter with indicating input and output. It is housed in a plastic case. A permanent magnet is fastened to the side of the case so that it can be attached to a door or post while searching for trouble in the device. The detector gets its current (+5 volts) from the device being tuned by means of two capped wires. The logic signals are also fed to the inputs of the detector by two capped wires. G.Y.

N79-14987# Joint Publications Research Service, Arlington, Va.

DIFFRACTION OF LIGHT IN ACOUSTIC SURFACE WAVES **c71**

Yu. I. Posudin and V. G. Grits *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 14-17 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 93-95 (For primary document see N79-14983 05-99)

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The study of acoustic surface waves necessitates precise determination of their parameters: speed of propagation, amplitude and field distribution. The most precise methods of studying surface acoustic wave parameters, which do not perturb the medium being studied, are those based on diffraction of a coherent light wave in the surface waves. These parameters are studied using the laser probe method and the accuracy of measurement is evaluated. G.Y.

N79-14988# Joint Publications Research Service, Arlington, Va.

CALCULATING THE RESISTANCE OF A STRIP CONTACT ON AN INFINITE SHEET **c32**

O. A. Fayants *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 18-20 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 95-97 (For primary document see N79-14983 05-99)

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Using conformal mapping the resistance of a contact of unit length was determined in relation to a continuous electrode deposited on the lower surface of a sheet. G.Y.

N79-14989# Joint Publications Research Service, Arlington, Va.

INFORMATION-HANDLING CAPACITY OF A HUMAN OPERATOR IN DETECTION OF SIGNALS AGAINST A NOISY BACKGROUND **c54**

N. M. Novikova *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 21-24 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 97-99 (For primary document see N79-14983 05-99)

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Analysis of the information handling capacity of multifunction radar stations indicates that one of the main bottlenecks in handling and analysis of information is the human operator. In order to increase his information handling capacity and reliability it is necessary to investigate his time characteristics (the time for detection of a signal by the human operator as a function of the signal brightness) under conditions where time is short. Two series of experiments were conducted. In the first series, detection time was determined in the absence of noise. In the second series, detection time was determined in the presence of random pulses. G.Y.

N79-14990# Joint Publications Research Service, Arlington, Va.

ADAPTATION OF RADIO RECEIVER SENSITIVITY TO THE ANTENNA NOISE VALUE **c32**

V. N. Belyayev *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 25-26 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 99-100 (For primary document see N79-14983 05-99)

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If an electronically-controlled wide-band linear attenuator is connected between the input circuits and the anntenna, changes in its transmission coefficient will alter the sensitivity of the receiver and the level of useful signal and noise. Methods of automatic production of a control signal by the attenuator are considered. If the control signal depends only on the useful signal, the result is an automatic volume control system. If the control signal depends on the noise produced by detection of

the input, the result is an automatic sensitivity control system, which depends on the quantity of incoming noise. The automatic control system is useful with small signal-to-noise ratios. G.Y.

N79-14991# Joint Publications Research Service, Arlington, Va.

SPATIAL DIVERSITY IN RECEPTION OF ELLIPTICALLY POLARIZED SIGNALS **c32**

E. S. Golovin *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 27-31 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Moscow), no. 9, 1978 p 100-103 (For primary document see N79-14983 05-99)

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To combat fading, use is made of spatially diverse (doubled) reception with automatic selection or linear addition of two weakly correlated copies of a signal. But doubled reception makes it possible to obtain only the minimum advantage from decreased depth of fading or the signal-to-noise ratio. The possibility of significantly improving the characteristics of doubled reception by using circularly polarized radio waves is discussed. G.Y.

N79-14992# Joint Publications Research Service, Arlington, Va.

PREDICTING THE TIME OF OCCURRENCE OF EARTHQUAKES **c46**

Mikhail Aleksandrovich Sadovskiy *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 32-38 Transl. into ENGLISH from Zemlya Vselennaya (Moscow), no. 6, 1978 p 6-9 (For primary document see N79-14983 05-99)

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About twenty years ago it was impossible to predict the time of occurrence of earthquakes and many seismologists disputed the existence of earthquake indicators. It is now known there are dozens of such indicators and how to observe them. Some of the results of U.S.S.R. scientific investigations in recent years into earthquake prediction are presented. G.Y.

N79-14993# Joint Publications Research Service, Arlington, Va.

GLUSHKO COMMENTS ON SOVIET SPACE DEVELOPMENT **c12**

Valentin Petrovich Glushko *In its* Transl. on USSR Sci. and Technol.: Phys. Sci. and Technol., No. 58 (JPRS-72625) 16 Jan. 1979 p 63-67 Transl. into ENGLISH from Zemlya Vselennaya (Moscow), no. 6, 1978 p 56-58 (For primary document see N79-14983 05-99)

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Valentin Petrovich Glushko is the leading scientist in the field of rocket-space problems and the founder of Soviet rocket engine construction. Glushko's answers to questions addressed to him by Zemlya Ivselennaya (U.S.S.R. journal) are published. G.Y.

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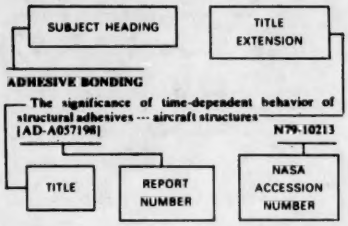

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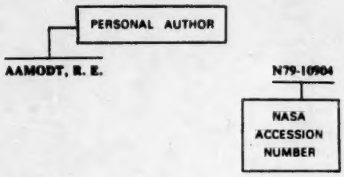

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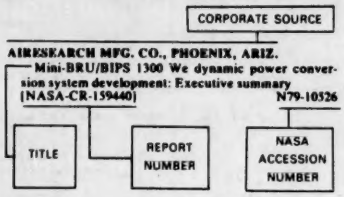

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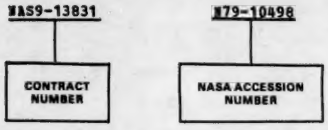

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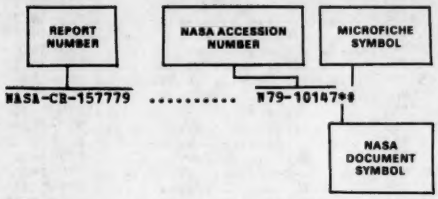

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AD-A060313 ..... N79-14085 #
AD-A060315 ..... N79-14145 #
AD-A060318 ..... N79-14294 #
AD-A060319 ..... N79-14303 #
AD-A060329 ..... N79-14911 #
AD-A060330 ..... N79-14663 #
AD-A060331 ..... N79-14036 #
AD-A060336 ..... N79-14102 #
AD-A060337 ..... N79-14846 #
AD-A060343 ..... N79-14101 #
AD-A060344 ..... N79-14422 #
AD-A060345 ..... N79-14399 #
AD-A060347 ..... N79-14836 #
AD-A060348 ..... N79-14845 #
AD-A060349 ..... N79-14423 #
AD-A060350 ..... N79-14318 #
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AD-E000177 ..... N79-14865 #
AD-E000206 ..... N79-14337 #
AD-E000207 ..... N79-14311 #
AD-E100090 ..... N79-14302 #
AD-E200164 ..... N79-14862 #
AD-E200165 ..... N79-14863 #
AD-E200167 ..... N79-14370 #
AD-E200173 ..... N79-14298 #
AD-E300325 ..... N79-14155 #
AD-E300326 ..... N79-14314 #
AD-E300332 ..... N79-14665 #
AD-E300333 ..... N79-14292 #
AD-E300342 ..... N79-14160 #
AD-E410057 ..... N79-14777 #
AD-E430102 ..... N79-14286 #
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AEDC-TSR-78-V10 ..... N79-14151*#
AEDC-TSR-78-V13 ..... N79-14150 #
AEDC-TSR-78-1/22 ..... N79-14035 #

AELSC-TR-23 ..... N79-14287 #

AERO-1253 ..... N79-14047 #

AEROCHEM-TN-200 ..... N79-14555*#

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AFAL-TR-78-21 ..... N79-14894 #
AFAL-TR-78-49-VOL-2 ..... N79-14094 #
AFAL-TR-78-49-VOL-3 ..... N79-14091 #
AFAL-TR-78-78 ..... N79-14898 #
AFAL-TR-78-85 ..... N79-14895 #

AFAPL-TR-77-52 ..... N79-14117 #
AFAPL-TR-77-75 ..... N79-14101 #
AFAPL-TR-77-93 ..... N79-14231 #
AFAPL-TR-78-10 ..... N79-14239 #
AFAPL-TR-78-16 ..... N79-14561 #
AFAPL-TR-78-27-VOL-1 ..... N79-14183 #
AFAPL-TR-78-27-VOL-2 ..... N79-14100 #
AFAPL-TR-78-32 ..... N79-14105 #
AFAPL-TR-78-38 ..... N79-14102 #
AFAPL-TR-78-52 ..... N79-14103 #
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AFGL-AFSG-387 ..... N79-14323 #

AFGL-ERP-634 ..... N79-14664 #

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AFGL-TR-78-0065 ..... N79-14669 #
AFGL-TR-78-0076 ..... N79-14147 #
AFGL-TR-78-0092(III) ..... N79-14667 #
AFGL-TR-78-0109 ..... N79-14671 #
AFGL-TR-78-0116 ..... N79-14323 #
AFGL-TR-78-0124 ..... N79-14659 #
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AFGL-TR-78-0146 ..... N79-14835 #
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AFGL-TR-78-0171 ..... N79-14896 #
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AFHRL-TR-78-26 ..... N79-14770 #

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AFIT-CI-78-113 ..... N79-14559 #
AFIT-CI-78-114 ..... N79-14182 #
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AFIT-LSSR-9-78A ..... N79-14148 #
AFIT-LSSR-22-78A ..... N79-14919 #
AFIT-LSSR-27-78A ..... N79-14921 #
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AFML-TR-78-70 ..... N79-14199 #
AFML-TR-78-89 ..... N79-14200 #

AFOSR-74-2709TR ..... N79-14190 #
AFOSR-78-0875TR ..... N79-14828 #
AFOSR-78-1142TR ..... N79-14825 #
AFOSR-78-1143TR ..... N79-14826 #
AFOSR-78-1164TR ..... N79-14843 #
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AFOSR-78-1251TR ..... N79-14811 #
AFOSR-78-1252TR ..... N79-14812 #
AFOSR-78-1253TR ..... N79-14931 #
AFOSR-78-1254TR ..... N79-14851 #
AFOSR-78-1258TR ..... N79-14090 #

AFOSR-78-1259TR ..... N79-14864 #
AFOSR-78-1261TR ..... N79-14713 #
AFOSR-78-1262TR ..... N79-14027 #
AFOSR-78-1277TR ..... N79-14043 #
AFOSR-78-1278TR ..... N79-14164 #
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AFOSR-78-1280TR ..... N79-14185 #
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AFOSR-78-1354TR ..... N79-14203 #
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AFOSR-78-1362TR ..... N79-14333 #
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AFWL-TR-77-234 ..... N79-14370 #

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AMC-54023.11-FR ..... N79-14630 #

AMMRC-TR-78-39 ..... N79-14202 #

AMRL-TR-77-50 ..... N79-14779 #

AMS-G-101 ..... N79-14972 #

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ARACOR-FR-78-P6 ..... N79-14910 #

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ARL/PSU/TM-78-52 ..... N79-14878 #
ARL/PSU/TM-78-204 ..... N79-14877 #
ARL/PSU/TM-78-212 ..... N79-14372 #
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ARO-10995.3-MC ..... N79-14911 #
ARO-12489.9-E ..... N79-14161 #
ARO-12640.31-M ..... N79-14836 #
ARO-12680.5-E ..... N79-14039 #
ARO-12689.5-MS ..... N79-14201 #
ARO-12922.8-P ..... N79-14909 #
ARO-12923.4-EL ..... N79-14320 #
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BC-SDAL-78-1 ..... N79-14147 #

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BCL-OA-TFR-78-3 ..... N79-14119*#

BCL-OA-TFR-78-2 ..... N79-14118*#

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BR64342 ..... N79-14158 #
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CEL-CR-78.018 ..... N79-14217 #

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DOT-TSC-FAA-77-17 ..... N79-14144 #
DOT-TSC-FAA-77-19 ..... N79-14066 #
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EPA-600/2-78-004M ..... N79-14635 #
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ETL-0153 ..... N79-14509 #
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E79-10009 ..... N79-14430*#
E79-10027 ..... N79-14438*#
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FAA-AEQ-77-12 ..... N79-14660 #
FAA-AEQ-77-14-VOL-1 ..... N79-14596 #
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FAA-AEQ-77-16 ..... N79-14592 #
FAA-AEQ-78-10 ..... N79-14593 #

FAA-AFF-220-78-01-3-VOL-3 ..... N79-14070 #

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FAA-ASP-78-3-VOL-2 ..... N79-14072 #

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FAA-AVP-78-1 ..... N79-14060 #
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FAA-NA-78-32 ..... N79-14058 #

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